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USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

CONTENTS

GENERAL

INTEGRATED MECHANIZATION AND AUTOMATION AS CATALYSTS OF TECHNICAL PROGRESS

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHENLOV SEV in Russian No 1, Jan 84 pp 15-18

[Article by Yuriy Maslyukov, first deputy chairman of USSR Gosplan, permanent chairman of Intergovernmental Committee on Cooperation of the Socialist Countries in Computer Technology]

[Text] Integrated mechanization and automation based on extensive use of microprocessor technology, industrial robots and electronics is of important significance in the decisions of the congresses of the communist and worker parties of CEMA countries. They now provide not only an increase of labor productivity but changing of its social conditions as well.

Special attention was devoted to these priority directions of specialization and cooperation and their interrelationship with work in the field of computer technology at the 36th meeting of the CEMA Session as well.

As shown by practice, successful solution of postulated problems is possible on the basis of development and implementation of a coordinated technical policy, an integrated approach to realization of it, implementation of a wide range of measures on the science-development-production-service cycle, including problems of unification, standardization and introduction.

The chairman of the USSR Council of Ministers Comrade N. A. Tikhonov noted at the CEMA session that a matter of primary importance under modern conditions is concentration of forces in the main sections of scientific and technical progress and creation of reserves for manufacture of modern energy-, material- and labor-conserving machines and also means of automation that utilize the latest advances of electronics.

The microelectronics component base (MEB) and microprocessor technology accumulate practically all advances of scientific and technical progress both in organization of production and in development of completely new production processes and of the corresponding equipment, materials and products. Qualitative shifts both in science and in a number of leading sectors of industry--metallurgy, chemistry, electrical engineering, the electronics industry and instrument building--are now determined to a considerable degree by the increased requirements for materials and assembled products on the part of developers and producers of computer equipment (SVT).

The Agreement on multilateral international specialization and cooperation in development and production of products of the microelectronics component base for computer equipment, special production equipment and of especially pure materials for microelectronics and the General agreement on multilateral cooperation in development and extensive use of microprocessor technology in the national economy of CEMA countries, signed during the 36th meeting of the CEMA session, were directed toward realization of the tasks of further development and extensive use of computer technology and on its basis of automated systems in the national economy of the participating countries.

As is known, the following division of labor among countries was planned by the first agreement:

computer-aided design systems--the Peoples Republic of Bulgaria and the USSR:

measuring and testing equipment--the Hungarian Peoples Republic;

optical-mechanical equipment--the GDR;

equipment for assembly of integrated microcircuits--the Polish Peoples Republic;

equipment for machining semiconductor materials--the Socialist Republic of Rumania;

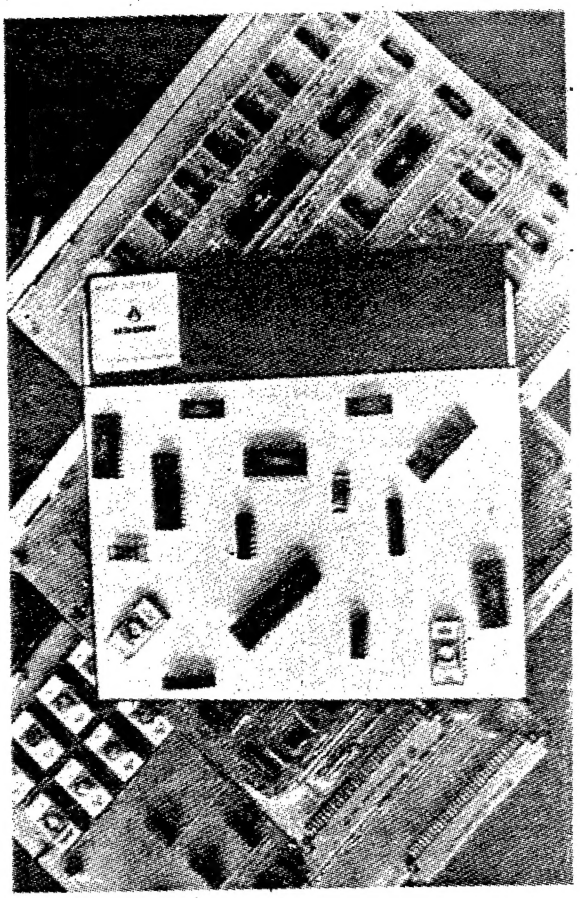
equipment for manufacture of structures of large- and superlarge-scale integrated microcircuits (BIS and SBIS)--the USSR;

research and monitoring and measuring equipment--the CSSR and GDR.

This agreement extends the framework General agreement on multilateral cooperation in development of the Unified standardized product base for electronics equipment, specialized production equipment and special materials for production of them, signed during the 35th meeting of the CEMA session.

According to the agreement, the Intergovernmental Committee on Cooperation of Socialist Countries in Computer Technology (MPK po VT) provides coordination of efforts in the field of microelectronics. This contributes to reduction of the deadlines of investigations based on the use of the latest advances of the participating countries.

Having considered problems of implementation of the agreement at its own 26th meeting (April 1983), the Committee adopted the Plan for development of products of the microelectronics component base for computer equipment. It provides development and beginning production of 125 types of BIS and SBIS of different functional complexity during 1983-1985. The Unified list of integrated microcircuits, used in computer equipment, was confirmed, according to which more than 500 types of MEB products are manufactured in the participating countries. It is recommended by the national parts of the MPK po VT that the indicated list be included in the export-import programs of the corresponding foreign trade organizations.



Microprocessor BIS and Microprocessor Technology

The need for further optimizaton of the nomenclature of MEB and SVT products was pointed out as an immediate task. This will make it possible to increase the efficiency of their production in the countries and to provide interchangeability, repairability and reliability.

One should dwell especially on the relationship of work in the field of MEB and SVT. It is achieved through the computer-aided design system of microelectronics products and through the architecture-logic part of computer devices.

Let us begin with a typical computer-aided design system. It contains the workstations of the designers based on micro- and minicomputers, linked by a

large (powerful) computer to the data bank. This provides development of BIS and SBIS (especially microprocessor and matrix circuits) and interrelationship with the design of units and printed circuit boards. This system is now being used to design products produced in the participating countries.

The Council on the Microelectronics Component Base, MPK po VT, is now devoting primary attention to an increase in output of promising production equipment, to a reduction of the laboriousness of work and to introduction of new production processes and procedures that provide a high technical level and reliability of the MEB. The leading scientific and production collectives of all participating countries have been recruited to solve these tasks, which are complex in nature.

Specialists of the countries have selected and coordinated typical progressive production processes for manufacture of BIS and SBIS and the nomenclature of promising prototypes of equipment to increase the efficiency of work in development of products of the microelectronics component base. The modular principle based on general technical requirements is used to develop them.

Modul-1 is a complex for standard logic (low-power and high-speed) and analog mass-produced microcircuits. It contains 91 types of equipment, of which 64 are now being exported. The technical requirements have been coordinated for the remaining types and the deadlines for the beginning of deliveries have been determined.

Modul-2 is a complex for microprocessor BIS and SBIS memory devices. It includes 109 units of equipment, 37 of which have already been delivered.

Modul-3 is a complex for superhigh-speed (SSIS) and superlarge-scale (SBIS) integrated microcircuits, including matrix BIS of different types. It includes 104 types of equipment, of which 30 are being mutually delivered.

Typical for all these complexes is the fact that their sections are controlled by automated systems based on micro- and minicomputers, while the complex units of special production equipment are controlled on the basis of built-in microprocessors. These installations include those which are designed for epitaxial growth, diffusion systems, ionic alloying systems, electron beams units, combination and projection exposure units, systems for measurement of BIS, SBIS, SSIS and other parameters.

After signing the agreement, production of especially pure materials for microelectronics also achieved further development. Their nomenclature was increased from 29 to 101, of which mutual deliveries have already begun for 51 of them.

Since the agreement is multischedule in nature, especially in specially pure materials, it can be implemented successfully only with the close cooperation of the MPK po VT with CEMA bodies and organizations and primarily with the Permanent Committees of CEMA on cooperation in the field of the radio engineering and the electronics industry, in nonferrous metallurgy, in the chemical industry, by the International Economic Organization Interkhim and so on.

The high complexity of the new generation of special production equipment for BIS and SBIS and the need for especially pure materials require an increase of capital investments in the sector, specifically to conduct scientific research and experimental design work. Investigations in solid-state physics now acquire important significance.

Further combination of the efforts of all participating countries is necessary to accelerate the development and assimilation in serial production of the promising nomenclature of microprocessor sets of BIS, memory BIS and SBIS. They should be directed toward development of new methods of design, more improved production processes and toward development of precision equipment and especially pure materials. The close coordination and interrelationship of the scientific research and experimental design work both in microelectronics and in computer technology play an ever increasing role in this.

To provide a unified technical policy in development of computer equipment and the latest MEB products, special production equipment and especially pure materials, having a goal of completely meeting the needs of the participating countries through their own production and mutual deliveries, further development of specialization should be achieved within the shortest deadlines, having provided an increase of capital investments in the corresponding sectors of the national economy.

I would especially like to dwell on implementation of the general agreement on microprocessor technology. Organizational problems are now being advanced to the forefront. We are talking about the fact that coordination in development and manufacture of this equipment and of the basic programs will be implemented within the Intergovernmental Committee for Computer Technology and in the use of it in the framework of the CEMA Committee for Scientific and Technical Cooperation.

Plans for development of computer equipment have been compiled within the committee to implement the cooperative program. They noted the extensive use of microprocessors in them on the basis of the latest products of the microelectronics component base and of programs.

The entire range of micro- and minicomputers is now being produced. They include the SM 1300 (SM 50/50), SM 1800 (SM 50/40-1), SM 1403 (SM 52/11), SM 1404 (SM 51/13) and so on. The SM 1634 (SM 50/60-1) and peripheral equipment --SM 6503, SM 5606 and SM 5610 floppy disk units, SM 6302, SM 6306, SM 6309 and SM 7108 printers, SM 7206 and SM 7401 alphanumeric displays, SM 7300 and SM 7301 graphics displays, SM 8105, SM 8107 and SM 8108 modems and so on have also received a start in life.

It is now planned to take one additional step forward. Development and production of a large new range of micro- and minicomputers using microprocessor technology of the family of the third generation of SM EVM [international small computer system] are planned. They are 8-, 16- and 32-bit machines. Their speed is 250,000 to 4.0 million ops. The main memory is up to 64-1,024 Kbyte. Further improvement of the peripheral equipment as well is planned.

Microprocessors find especially broad use in engineering SVT and primarily in control of displays, input-output devices and data processing and data preparation devices, peripheral memories, printers and so on.

The vigorous development of electronics will lead to serious technical and social changes related to the nature of human relations with machines. The capability to entrust solution of many control tasks of objects, data processing tasks and so on is being increased with an increase of its intelligent properties. The following main fields of extensive use of micro- and minicomputers based on microprocessor technology, more responsive to the needs of worldwide practice and that make it possible to achieve the greatest saving and social effect, can now be distinguished. These are primarily automated:

production process control systems (in chemistry, metallurgy, the oil and gas industry and so on);

production equipment, machine tool, machinery, power plant, electric drive, hydroengineering facility and industrial robot control systems;

energy, line-dispersed object and transport flow systems (high voltage transmission lines, gas pipelines and so on);

organizational management, operational planning and dispatching systems, including systems for the workstations of ITR [engineering and technical personnel] and employees;

industrial, scientific and medical monitoring and measuring and diagnostic devices and instruments;

communication equipment and devices for data processing and transmission;

devices for the complex of transport and other machines, equipment, systems and control of them;

mass individual and consumer systems, devices and instruments.

The unified microelectronics component base, unified interfaces, instruction system and programs compatible with the produced types of SM EVM and existing peripheral equipment, are used in the micro- and minicomputers to be developed.

Development of investigations in analog-digital and digital-analog signal converters and communication devices is required to provide interconnection of micro- and minicomputers and also of peripheral equipment with control and regulation objects.

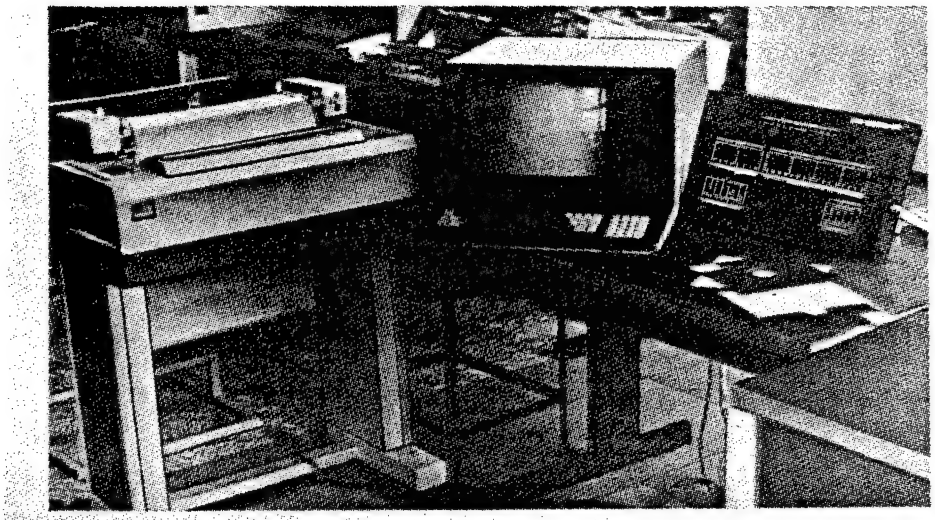
More extensive specialization of the countries on the basis of generalization of all the theoretical and practical reserve for automatic data control and processing systems, control of mechanisms and machine tools, electric drives and industrial robots, communication systems and other facilities is required for extensive introduction of these micro- and minicomputers. Promising

Data Processing System Using Microprocessor BIS

methods of development of unified designs and interfaces based on the concept of the third generation of SM computers should also be developed and closer contacts with related sectors should be established. Specialized plants for manufacture of microprocessors for SVT and other sectors of industry can be allocated in the countries.

The development of investigations to create a Unified system of switching technology devices, numerical program control systems for machine tools and industrial robots, conducted within the framework of the corresponding multi- and bilateral agreements, is also related to further improvement of the micro-electronics component base and micro- and minicomputers.

Expansion and deepening of cooperation of the fraternal countries in the field of microelectronics and microprocessor technology will make it possible within a relatively short period to improve considerably the quality of the latest products of MEB and SVT and to increase output of them. And this will in turn lead to an increase of the technical level and labor productivity in many other sectors of the national economy of CEMA countries. The commodity circulation of microelectronics products, special production equipment, especially pure materials and computer equipment based on microprocessors, increasing from year to year, will play an important role here.



Engineer's Workstation

This is yet another indication of the broad capabilities of CEMA countries to increase the technical level of production and to convert it to the intensive path of development.

6521
CSO: 1863/151

COMPUTER STARTUP, SERVICING PRACTICES CRITICIZED

Moscow SOVETSKAYA ROSSIYA in Russian 25 Apr 84 p 3

[Article by V. Shmelev, director, main administration, RSFSR TsSU [Central Statistical Administration]; K. Karpov, laboratory director, USSR Academy or Sciences Computer Center; G. Klishina and R. Vagner, inspectors, Novokuznetsk KNK [Scientific Consulation Committee]; A. Sergeyev, inspector, Cheboksary KNK; M. Berkovich, KUZNETSKIY RABOCHIY correspondent; and V. Ovcharov and I. Ivanov, SOVETSKAYA ROSSIYA special correspondents: "SOVETSKAYA ROSSIYA Unannounced Investigation; Absentee Computer"]

[Excerpt] Many owners of computers have been feeling the costs of electronic servicing. Even the largest. For example, the computer center of the USSR Academy of Sciences, which relatively recently received a brand new high-capacity YeS-1060 computer. But it took a long time to hook it up. For eight months scientists corresponded with one of the enterprises called upon to take care of debugging of the computer. The debugging itself took just as long. The slowness of those responsible for this job can be expressed in money: The losses exceeded 800,000 rubles. Of course, the computer in the end started working, but many defects had to be eliminated by the scientists through their own manpower.

Of course, large computer centers can themselves eliminate a number of defects and perform preventive maintenance, and sometimes even more complicated repairs. But even here one recalls the good old days when manufacturing plants handed over their computers at the customer's site. And not just formally, but in an operating, functioning version. And the entire handing-over cycle then took only a few weeks. But now, when, seemingly, the business is run with a wide scope, it has become more of a "long drawn-out affair" with the electronics. Enterprises called upon to speed its introduction, on the contrary, occasionally act as a hindrance. And the plants themselves are even less responsible for quality.

The costs of this practice are especially felt at the sites. In organizations of the RSFSR TsSU, for example, dozens of high-throughput computers are being put into service after long months of delay. In last year alone these delays cost the State many millions of rubles.

But even if the computer is finally started up, oh how hard it is to bring it up to its rated performance. They have been struggling with this for a long time at the West Siberian Metallurgical Combine. Other Kemerovo specialists have no less desparately been attempting to obtain spare parts for computers.

However, there is in the Kuznetsk Basin also a very instructive address, of interest, in our opinion, to many industrial centers of the country. We have in mind the Novokuznetsk enterprises where computers work, as they say, night and day. They have been able to assign a full work load to them in Zapsibgeologiya [expansion unknown] and at the computer center of the municipal department of public health. And the Yuzhkuzbassugol' [Southern Kuznetsk Basin Coal] Association is operating equipment even above the norms. How is this possible? Very simply. The computer center, solving its own problems, is serving four more large organizations, i.e., Gidrougol' [expansion unknown], Kuzbassshakhtostroy [expansion unknown], Sibgiproshakht [expansion unknown] and VNIIGidrougol' [All-Union Scientific Research and Planning and Design Institute of Mining of Coal by Hydraulic Method]. All this is a business-like approach--not building a dwarf-sized business for each.

In Novokuznetsk they are also thinking about further reorganization--the formation of a citywide electronics service. Services numbering approximately 20 specialists are housed at each computer center (there are 15 in Novokuznetsk) for the purpose of debugging and repairing computers. Why not organize a single repair section, assigning to it all computers in the city? Calculations have shown that this will make it possible to cope efficiently with repairs and servicing and will free over a hundred more people.

And let us address our last wish to industrial ministries whose plants do not always produce high-grade computers. The on-site performance of final adjustments occasionally requires considerable expense.

8831
CSO: 1863/194

EXHIBITION OF MICROPROCESSOR TECHNOLOGY

Moscow EKONOMICHESKAYA GAZETA in Russian No 14, Apr 84 p 24

[Article by A. Kondrashov: "Microprocessors with Macro Capabilities"]

[Text] The exhibition "Microprocessor Applications in the National Economy" (renewed exposition) opened in the "Computer Engineering" Pavillion at the USSR Exhibitition of National Economic Achievements. Some 67 enterprises and organizations of 20 ministries and departments presented 190 exhibits. Among them were full scale exhibits: electronic computers, heardware, devices as well as various display tables and test stands demonstrating achievements in the field of modern high performance equipment design.

Alignment engineer P. Kirillin of the Minsk Production association for computer equipment, by pressing on a keyboard, demonstrates the capabilities of the YeS1061 computer presented at the exhibition. There are columns of numbers on the display screen and there is no small number of them. The computer, which is intended for solving a large group of problems, performs up to two million operations per second. The most important aspect though is the feature incorporated in the design which allows for the probability of parallel operation of a large number of peripherals tied into the computer and a processor, which significantly enhances its efficiency.

Microprocessors are becoming increasingly widespread in the control of production lines and installations, manipulators and machine tools. In agriculture, they assist in controlling the operating conditions of agricultural equipment, the processes which take place in animal husbandry and crop growing operations, and provide for travel safety and savings of fuel and energy resources in transportation.

Minicomputers and microcomputers as well as integrated circuits and microprocessor sets and systems were widely represented at the exhibit.

One of the most interesting exhibits at the exhibition was the "Iskra-226" automated work station for a production process programmer. Having small dimensions, it is intended for the automation, preparation, monitoring and editing of programs for numerically program controlled machine tools. Its capabilities are quite extensive, which is responsible for the interest of production workers. The component base of the automated work station consists

of microprocessors and LSI circuits (large scale integrated circuits), which are responsible for the promising future of the model at the present day.

The "Elektronika NTs80-20" interactive computer sets (DVK) represent a new class of general purpose microcomputers for individual use. They are distinguished from previous models by the direct personal control over all stages of data processing and storage.

One of the display stands tells of experience with the introduction of an automated control system for the production process of making hemicellulose, based on the utilization of microprocessors at the Krasnoyarsk Cellulose and Paper Combine. The use of the automated system has made it possible to improve product quality.

Consultations will be held at the exhibition base for specialists with the Unified System of Computers and Small System of Computers.

The exhibition will continue until December.

In the photographs [not reproduced]: behind the set of displays of the YeS1061 computer are alignment engineers P. Kirillin (in front) and G. Varenik; working at the UMGD-1 floppy disk data preparation peripheral used as part of the system of small computers is engineer O. Zhuravlev.

8225
CSO: 1863/156

SM 6404 TERMINAL FOR PREPARATION AND INPUT OF GRAPHICS DATA

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA (NAUCHNO-PROIZVODSTVENNYY SBORNIK) in Russian No 2, Apr-Jun 84 p 66

[Text] The SM 6404 graphic information preparation and input terminal is designed for use in computer-aided design complexes and systems. It executes the functions of reading, coding, preliminary processing, storage and computer input of graphic information.

The terminal is comprised of two primary components: plotting board, designed for the semiautomatic reading and coding of graphic information, and the UVK SM 1800 set of devices that accomplish the preliminary processing and storage of the graphic information, and the output of message for the operator.

The preliminary processing of the graphic information is accomplished with the SM 1803 host microcomputer, which comprises a part of the terminal. The accumulation of the coded information, and the loading of processing programs into the on-line storage is accomplished by means of SM 1800.5602 floppy disk external storage device. Messages for the operator are generated during his interaction with the terminal by means of the SM 1800.7201 alphanumeric video terminal.

Technical Characteristics

Dimensions of the working field of the plotting board, mm	850 x 600
Resolution, mm	0.1
Reading error, mm	$\pm$0.4
Point coordinate reading cycle duration, milisec	10
Graphic information medium thickness, nm	$\leq$2.5
Type of connection of reader to working field	inductive
Coding modes	discrete and continous
Number of positions in the matrix of variable designations	256
Interface type	IRPR, Common BUS

Power consumption, kV·A	≤0.7
Terminal weight, kg	≤290

Designer--Kiev Scientific Research Institute of peripheral equipment.

12678
CSO: 1863/199a

UDC 681.326.32

DEVICES FOR ACTIVATION OF PROCESSOR COMPONENTS OF PS-2000 MULTIPROCESSOR

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 84 (manuscript received 11 May 83) pp 29-31

[Article by S. Ya. Vilenkin, N. I. Golovan, I. L. Medvedev, A. S. Nabatov and G. Yu. Pivovarov]

[Text] The architecture and structure of a multiprocessor system based on a high-speed parallel computer were described in [1].

Devices for activation of processor elements (PE) provide individualization of them in the total command flow. Realization of these devices is a reflection of the specific architecture with a single command flow and many data flows. Thus, for example, upon execution of the conditional operator

IF C THEN S1 ELSE S2,

where C is the conditions checked in each processor element and S1 and S2 are operators executed by the processor element as a function of the truth or falseness of the condition, a branch does not occur in a multiprocessor system. Both operators S1 and S2 should be executed, but in different sets of processor elements. Therefore, the processor element in which C = = TRUE and that in which C = FALSE must be activated separately so as to execute S1 in the first set and S2 in the second set.

Let us consider as an example the algorithm for determination from n arrays of positive integers A_i (i = 1, ..., n) of data whose value is not less than the given value of K. Let us execute the task in a solution space with N processor elements, using object execution in parallel [2]. The result of solution is n arrays B_i, distributed one each in each processor element.

Solution of the problem requires the following operations:

reading of the next j-th element of the array in each processor element;

subtraction $A_i[j] - K$;

writing of elements $A_i[j]$ into arrays B_i and accumulation of addresses B_i in those processor elements in which $A_i[j] - K \geq 0$.

The latter action requires realization of the cutoff mechanism of the processor element in which the element of array $A_i[j]$ was less than K (this mechanism is known as the activation mechanism). The processor elements, cut off for the time of execution of the operation, are called inactive elements and those that execute the operation are called active elements.

The considered algorithm illustrates activation by data in the processor element. One can generally say that the activation mechanism in the given example provides branching of the program by the data in the processor element.

Branching is executed in the following manner in a serial machine:

R: if $\alpha = 1$, then branch to X,
if $\alpha = 0$, then branch to Y.

The program at point R of the considered algorithm analyzes the value of the element of the array and is switched to branch X or Y as a function of whether condition α is satisfied.

In a parallel processor, the analysis operation divides the processor element into two subsets: in the first $\alpha = 1$ and in the second $\alpha = 0$ (one of them may be empty). The first subset requires execution of the branch of algorithm X and the second requires execution of algorithm Y. Simultaneous execution of both branches is impossible since there is only one microinstruction flow in a parallel processor. Accordingly, it is necessary:

to activate the subset of the processor element with $\alpha = 1$, cutting off the subset with $\alpha = 0$;

to generate the branch of algorithm X in the active processor elements;

to cut off the subset of the processor element with $\alpha = 1$ and to activate the processor element with $\alpha = 0$;

to generate a sequence of microinstructions of branch Y in the active processor elements.

Thus, all branches of the algorithm, formed as a result of analysis of the data to be processed, should be processed serially in a parallel processor.

Some acceleration can be provided by analysis of the presence of a processor element with $\alpha = 1$ or $\alpha = 0$ in the case when the data to be processed are characterized by a high mean value of one or another value of α. For example, if the excess of the value corresponds to the boundary value (emergency display of the sensor), then it is reasonable to first analyze whether processor elements with this value of the element of the array exist, instead of unconditional generation of the branch corresponding to $A_i[j] \geq K$. It must be noted that we are talking only about a saving of time in solution of the problem, nothing more. It is permissible to execute the branch corresponding to $A_i[j] \geq K$ in the absence of a processor element with this value of elements of the array and in this case all the processor elements will be cut off by the activation mechanism and the program instructions are processed under "no load" conditions without variation of the addresses and data in the processor element.

In algorithmic execution in parallel, the activation mechanism provides both branching by data and determination of the subsets of the processor element according to the task algorithm. Thus, the procedure of retransmission of the variable from one to all the processor elements (activation of a given processor element) is typical for a matrix multiplication algorithm and activation in groups containing the number of processor elements equal N/2, N/4, N/8 and so on is typical for the fast Fourier transform (BPF) algorithm.

Let us consider the basic functions of activation in more detail.

The activation register. If there is a small number of processor elements in the solution space, a register, each bit of which determines the activity of the corresponding processing element, can be realized in the controller. Depending on the bit width of the controller, any required combination of processor element activities is formed in the register during one or more loads. As the number of processor elements increases, an ever greater number of buses is required for the controller to communicate with the solution space; since the activation word begins to exceed considerably the bit width, its load is slowed down more and more. Thus, a total of 256 buses should be output from the controller at N = 256 and at bit width of 16 bits, while the loading of the activation word is carried out by 16 transmissions.

At the same time, a number of algorithms (specifically, of matrix algegra and the fast Fourier transform) requires activation of the processor element according to regular law. Realization of activation by the number of processor elements provides sufficiently many possibilities. An eight-bit register with several additional bits that control the mode of using the activation word can be realized in the controller for the same 256 processor elements. The following activation modes can be provided: one of all processor elements with number K is active, all processor elements with the exception of one with number K are active, all processor elements with even address or all with odd address are active, all processor elements with address a multiple of 2^2, 2^3 and so on are active, all processor elements with a 1 in the address digit 2^1 (two are active, two are off and so on), 2^2 (four are active and four are off and so on), 2^3 and so on are active and all processor elements from 0 element to number K are active or vice versa--all elements fron number K to the last element are active. $\text{Log}_2 N$ of buses of the activation word and 2-3 buses of the method of activation are generated from the controller to the processor element.

Similar possibilities are provided by the hierarchy of masks, for example, by the position access mask in eight processor elements, where the entire field is divided into eight processor elements. The activity of each eight is controlled in turn by the activity mask of eights. Two-level masking by eights provides activation of $8^2 = 64$ processor elements and three-level masking provides activation of $8^3 = 512$ processor elements. The advantage of hierarchical masking compared to activation by number is the possibility of being given any combination of activities at each level of the hierarchy. A total of 2-3 buses of the activation method and $R\text{log}_R N$ buses, where R is the number of bits at the level of hierarchy, is generated from the controller to the processor element. We note that the value of R can be selected individually at each level of activation.

The most widespread in modern multiprocessors is activation by the position register of activation, not concentrated in the controller, but separated by processor elements. A flip-flop, the status of which determines the activity of the processor element, is realized in each processor element. The load to the flip-flops can be executed from the controller or directly from the processor element. Specifically, a block of adjustments of activity can be loaded in the main memory of each processor element. The activity tasks are read as needed from the memory during solution and are loaded to the activation flip-flops.

Activation by the results of data analysis. Data analysis is performed in the family of IBM/360-IBM/370 computers by storing the features of analysis of the result of the operation in a specialized register of conditional code: $= 0$, >0, < 0. Both branch by condition and branch by group of conditions, i.e., by the feature $\neq 0$, ≥ 0 or ≤ 0, can be executed by the instructions of conditional branches. A similar principle of data analysis can be realized in the processor element.

The result of each operation in the arithmetic unit of the processor element (either of an operation accompanied by the corresponding index from the instruction) is analyzed by the feature $= 0$, > 0 or < 0 for branching by data in a parallel processor. The results of analysis are recorded in the conditional code register. Any subsequent commands can use the fixed conditional codes for activation of the processor element.

The priority circuit. The need to pack elements of an array, segregated as a result of analysis, into a continuous array occurs rather frequently in algorithmic execution in parallel. The procedure can be performed by alternate polling of the activity of the processor element, beginning with an element having a zero address. Having found the active processor element, the controller transmits a word from it to the necessary processor element or to the controller.

A specialized flip-flop of the priority circuit can be realized in each element to accelerate the search for the next active processor element. The outputs of all flip-flops are analyzed by the priority circuit, which provides review of the flip-flops of this circuit, beginning with the processor element having zero number, and activates one processor element in which the first reset flip-flop of the priority circuit (with ordered review by the numbers of the processor element) was detected. An exchange operation with active processor elements can be executed, after which the flip-flop of the priority circuit in it is reset. The priority circuit again continues the review, activating the next processor element.

The priority circuit permits transmission of data from the processor element in which the iterative process was completed or in which comparison with the setting occurred or the value of the parameter went beyond a permissible boundary and so on. The priority circuit provides packing of data upon execution of search and sorting operations.

Since the activation operation of the processor elements essentially determines the predicates given for them, the most complete apparatus for realization of these predicates is Boulean algebra. In the general case, this algebra can be realized in the arithmetic logic unit of the processor element, but a special processor (we will call it an activity processor) can be created in each processor element for realization of this algebra to accelerate the computing process.

Let us consider as an example one of the algorithms for search of the extreme values of the function, the directive values of which are loaded into the memory of the processor element. The task should be solved for object execution in parallel. The i-th value of the function in the core of the program is loaded into the arithmetic units of the processor element. The (i + 1)-th value is read and is compared to the i-th value and the result of analysis is stored. The (i + 2)-th value is read and is compared to the (i + 1)-th value. The result of analysis is stored and is compared to the previous analysis. The results of analysis determine the sign of the derivative. Variation of the sign of the derivative occurs at the point of the extreme value (for simplicity, points with zero value of the derivative are not considered).

Let us analyze which requirements the given task places on hardware. Determination of the sign of the derivative is carried out by activation by data. The result of analysis should be stored in a universal register or in the activation flip-flop of the processor element, and the latter version is more preferable if the share of the operations that require storage of the results of analysis in the class of tasks to be solved is high. The use of a universal register in this case leads to inefficient use of it, since the result of analysis is three-bit, while the word length of the universal register is usually higher.

After the next value of the derivative has been received, the operation of comparison of derivatives, i.e., of conditions recorded in the activity flip-flops or in the universal register, is required. The activation operation must be realized by the equality of conditions written in the activity flip-flops. It is easy to find examples of activation by disjunction (if at least one of two alternately checked conditions is executed) or by conjunction (if a combination of checked conditions is executed) of states of the activation flip-flops.

The activity processor should contain some set of main operations frequently used. If realization of a function absent in the set of operations is necessary, the contents of the flip-flops should be transmitted to the universal registers for realization of the required operation in the universal arithmetic unit. The result of the operation is returned to the activation flip-flops.

Investigation of the activation devices of the processor element in multiprocessor systems with common command flow indicates that external activation by register and activation by priority circuit can be organized in systems of this type, along with activation of the processor element.

Activation by data is most frequently used to realize conditional operators with conditional vector. The activation register with designation of the active elements finds broad application in processing incomplete lines when inactive processor elements could cause emergency shutdowns and also in information retrieval tasks when arrays are divided into parts.

Priority circuits are most effective in exchange of information with peripheral devices, in selections by features from unordered arrays, in allocation of subarrays by keys from ordered arrays and in a number of other tasks that require ordered activation.

The absence of a wide range of activation devices considerably reduced the capability of programming and the effectiveness of such foreign parallel systems as ILLIAC-IV and PROPAL-2.

A combination of the described activation devices is realized in the parallel processor; a six-bit register-counter in the controller provides activation by the number of processor elements. Specifically, a processor element can be selected with numbers from zero to a given number or from a given number to a maximum number and activation by groups can be selected (one processor element is active, the next is inactive, or two are active, two are inactive, or four are active and four are inactive and so on). Activation by number permits determination of the processor element by regular laws, expending little time on activation and most frequently one or two microinstructions.

Four activation flip-flops, serviced by an activity processor, are realized in each processor element. The diagram of analysis of states of the processor element permits activation of the processor element that records overflow of the bit net or of the processor element, the result of the operation in which is equal to zero, ≥ 0, ≤ 0, > 0, < 0. The priority circuit determines the first active processor element with ordered review of activities. The activation devices are serviced by the activity processors.

Because of this, a wide range of tasks inaccessible to other parallel systems with common command flow is solved effectively in the PS-2000.

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6521
CSO: 1863/157

DEVELOPMENT OF MICROELECTRONICS IN HUNGARY

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 1, Jan 84 pp 54-56

[Article by Ferenc Banyai, technical director of Microelectronics Enterprise of Hungarian Peoples Republic]

[Text] Microelectronics is now one of the most dynamically developed areas of industry. There is now no sphere of activity where its advantages would not be manifested. One of the indicators of the level of development of a country today is how widely microelectronic components are used in industry and agriculture. Recognizing its enormous role, the governments of many countries are directing considerable funds toward development of a modern microelectronics component base. It was decided in December 1981 in the Hungarian Peoples Republic to combine scientific research facilities and industrial enterprises and to create the Microelectronics Enterprise of the Hungarian Peoples Republic on this basis, beginning on 1 January 1982.

The enterprise operates according to the State program for development of production of electronics assemblies and parts and according to the State medium-term plan of scientific research and technical developments for the current five-year plan.

Creation of the Enterprise should contribute to solution of the following main tasks:

production of microelectronics components and assemblies with modern technical and economic parameters, provision primarily of domestic instrument building by them, expansion of the variety of electronic production equipment and an increase of its competitiveness;

expansion of the export trade fund with regard to the limited internal market of the Hungarian Peoples Republic, i.e., production of electronic components in the appropriate quantities and above the necessary quality for purposes of exchange, utilizing to the maximum extent the advantages of international socialist sharing of labor;

an increase of the net currency income of the Enterprise and of the entire national economy due to a significant reduction of imports from the capitalist countries;

participation in cooperation within CEMA, which will help to eliminate the consequences of discrimination restrictions observed on the world market and will provide production of electronic devices in our country and other fraternal countries by the necessary materials and components;

extensive use of the capabilities of microelectronics by enterprises in production of modern equipment, devices and high-level machines suitable for export;

development and distribution of ordered large-scale integrated circuits (BIS).

According to the government program, training of specialists has also been entrusted to the enterprise for broader and more efficient use of highly complex integrated microcircuits and formation of the corresponding range of designers and specialists who work with these microcircuits at consumer enterprises.

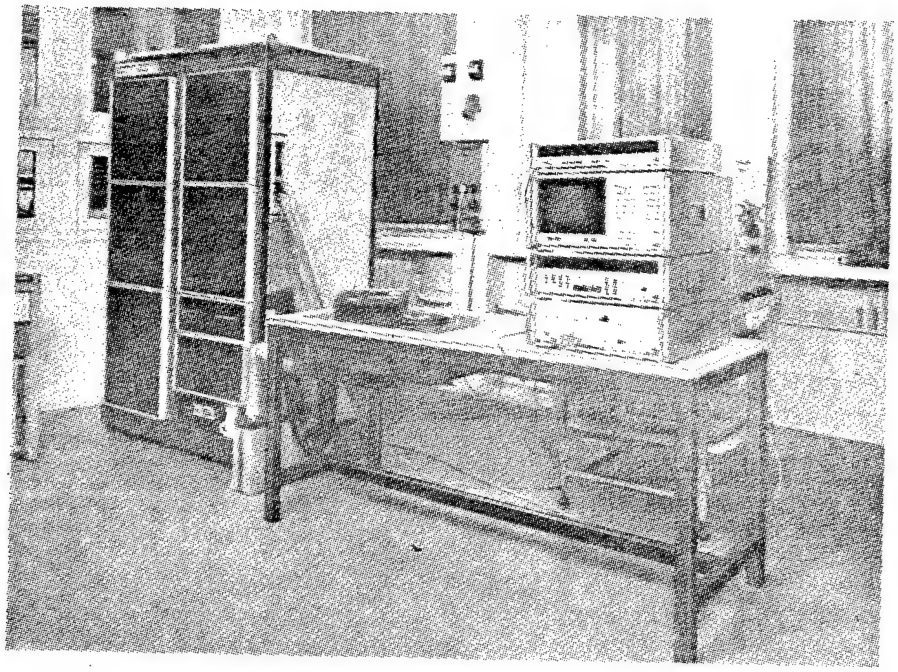
The main sphere of activity of the Microelectronics Enterprise is production of monolithic integrated microcircuits. Beginning in 1985, it will begin serial output of integrated microcircuits and digital devices on MOP [metal oxide semiconductor] and bipolar technologies: from design to final measurement. Important attention will be devoted in this to production of ordered BIS, simplified versions of which are matrix BIS.

Another important area of activity of the Microelectronics Enterprise is development and small-scale production of hybrid integrated microcircuits, which have found broad application in consumer goods and especially in professional electronics.

Moreover, control computers for measuring systems, designed to measure highly complex microelectronics products, are being developed and produced in small series at our enterprise, which is already a task of primary importance. Complexity of the integrated circuit can reach the complexity of computers, for example, in a number of microprocessors. They can be measured only by high-speed systems.

Our enterprise together with Soviet specialists has developed large measuring systems operating at frequencies of 10 and 25 MHz, which have become known under the name IKOMAT. Approximately 60 IKOMAT-110 measuring automatons now operate at different semiconductor equipment plants in the USSR and GDR. The Enterprise manufactured and delivered two new types--the IKOMAT-115 and IKOMAT-200--to the USSR in 1982. This equipment considerably facilitates checking of products at plants that produce integrated circuits and informs the users about the quality of purchased products.

Rather extensive work is being carried out at the Enterprise on development and production of equipment for hybrid integrated circuits. Cathode-ray tube evaporators, magnetron spraying sources, ignition and drying furnaces, stencil printing units, optical reduction cameras and so on are being used in many socialist countries. Development of this equipment is a serious contribution in development of the microelectronics of the socialist countries.

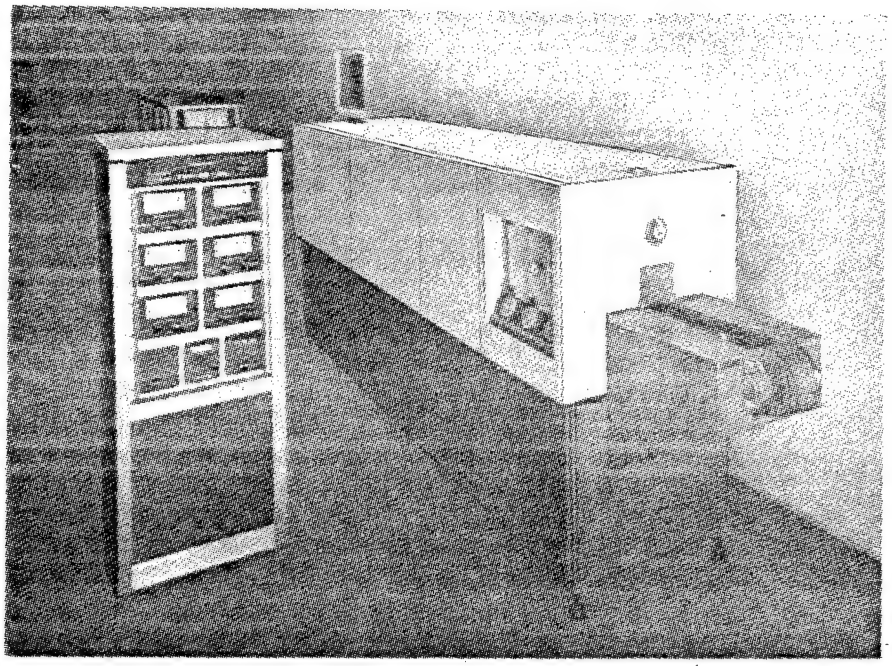


IKOMAT-200 Integrated Microcircuit Measuring Unit

Broad international ties are typical for the Enterprise. A number of domestic workers of the Enterprise are members of sections 6 and 8 of the Permanent CEMA Committee on Cooperation in the Radio Engineering and Electronics Industry and also of two sections of the Council on the Microelectronics Component Base of the Intergovernmental Committee on Cooperation of the Socialist Countries in Computer Technology.

The bilateral ties of the Enterprise are reflected in long-term agreements on scientific and technical cooperation with almost all the socialist countries. Moreover, we maintain direct contacts with almost 20 enterprises of these countries, which are applicable to multi- and bilateral scientific and technical cooperation, encompassing specialization, standardization and also commercial activity.

Microelectronics is a relatively new, dynamically developed sector of science and industry. Broad cooperation is determined by the need for rapid exchange of new results, organization of production of optimum series of individual types of products and efficient use of expensive equipment. This can be achieved only by specialization.



TsG-62 Furnace for Burning Compounds

Equipment manufacturers in the Hungarian Peoples Republic annually use 6,000-7,000 types of integrated circuits and semiconductors. The need in each of them fluctuates from several thousand to several hundred thousand units. None of the enterprises is capable of producing this quantity of diverse types. Close cooperation between the fraternal countries in this field is therefore necessary, which will make it possible to increase the variety of products and will fully satisfy the needs for electronic products. Moreover, expensive production equipment with high technical parameters is required to produce integrated circuits. Development and output of it for a single country are impossible in many cases. The role of cooperation in this field within CEMA both at present and in the future will consist in coordination of the directions of scientific research and developments on the one hand and in the use of the advantages of international cooperation and in working out proposals on specialization of production of this equipment on the other hand.

The work of section 1 of the Council on the Microelectronics Component Base and section 6 of the Permanent CEMA Committee on Cooperation in the Radio Engineering and Electronics Industry has yielded good results. Specialization of production has been determined for most equipment. It should be carried

out even more efficiently in the future so that CEMA countries can reach the worldwide level as soon as possible.

Our Enterprise would like to participate more widely in production of ordered BIS and output of automatic measuring equipment in international cooperation.

Ordered BIS are a new direction in development of microelectronics components. Electronic systems previously consisted of integrated circuits included in catalogs according to specific functions. The main task of designers was intelligent subordination of the integrated microcircuits selected from catalogs to the necessary functions and tasks and to develop the equipment on this basis.

Our strategy in development of semiconductor microcircuits reflects the worldwide trend, according to which the functions of electronic equipment should be designed and provided in the components themselves. Therefore, the designers of integrated microcircuits based on silicon should accurately image in the operation of the equipment into which integrated microcircuits are built, for effective achievement of the postulated goals.

We would also like to specialize in design and production of the IKOMAT series in the future and production of measuring automatic equipment in international cooperation. Development of new measuring systems has already begun in the Hungarian Peoples Republic jointly with specialists of the GDR and USSR. The most immediate task is to manufacture a measuring system of the IKOMAT-125 type, which operates at a frequency of 20-25 MHz.

Cooperation of specialists of CEMA countries has a fruitful influence on the scientific research activity in each fraternal country and contributes to development of efficiency equipment. The microelectronics enterprise of the Hungarian Peoples Republic is a clear example of the fact that participation in multi- and bilateral cooperation on a mutually advantageous basis, on the one hand, creates favorable conditions for development of the Enterprise and on the other hand, contributes to better satisfaction of the needs of all CEMA countries.

6521
CSO: 1863/151

UDC: 681.324

APPROACH TO IMPROVING DATA PROCESSING EFFICIENCY IN COMPUTER SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, May-Jun 84
(manuscript received 25 Nov 81) pp 11-15

BRYUKHOVICH, Ye. I., NAGORNYY, L. Ya. and YUR'YEV, Yu. N.

[Abstract] The possibility of eliminating the factors which degrade data processing performance indicators in computer systems based on modern principles of organizing the computational process is examined. The function of a θ-level computer system is analyzed approximately from the viewpoint of the organization of the physical and logical structures of one of the levels. The proposed approach ensures the utilization of modern architectural principles of computer system organization (parallelism, decentralization of memory, control and processing functions, and structural and functional flexibility). A system modeled by the proposed approach will be versatile, productive, viable and expandable; it will provide possibility of optimum combination of the smallest required system response time and the greatest possible utilization of low-level system resources. References 7: 3 Russian, 4 Western.
[209-6900]

UDC: 681.325.2

ORGANIZATION OF DIGITAL OPTOELECTRONIC PROCESSOR FOR IMAGE PROCESSING IN SPATIALLY CONTINUOUS FORM

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 3, May-Jun 84
(manuscript received 28 Dec 82 after revision) pp 16-19

OCHIN, Ye. F.

[Abstract] A structure is proposed for an optoelectronic processor which handles images in the form of the sum of binary spatially continuous images. The proposed device processes images digitally, and represents the image spatially in analog fashion. Spatial-logical functions describing the operation

of spatially continuous logic elements are derived. Holographic random access memories to store the image data is described. Except for the holographic memory, the processor proposed can be built with available components. The processor provides accurate representation of the original images, the results of intermediate computations and final results; the format of the original images and the resolution of the processor can be established by software. Nonlinear operations can be performed over the images. The realization of an operation is presented in an appendix. Figures 1; references 7: 6 Russian, 1 Western.
[209-6900]

UDC: 681.142.6.019

INTEGRATED-INJECTION LOGIC MAJORITY ELEMENT

Tashkent IZVESTIYA AKADEMII NAUK UzSSR: SERIYA TEKHNICHESKIKH NAUK in Russian No 3, May-Jun 84 (manuscript received 25 Feb 83) pp 3-6

AKHMADZHANOV, A. and SMOLYAK, A. M., Uzbek Kibernetika Scientific-Production Association, Uzbek SSR Academy of Sciences

[Abstract] An algorithm for constructing a multi-valued element is described in which the number of bits in each signal is recognized, the number of output signals containing the same number of bits are added, and the symbol of the alphabet whose value coincides with that of the majority of the input signals is identified. A circuit which implements the algorithm is constructed with K198NT1 and K198NT5 transistor assemblies which demonstrates that the algorithm is stable and can operate the supply voltages operating from one volt to the breakdown voltage of the collector junctions of the transistors. Figures 2; references 3; 2 Russian, 1 Western.
[191-6900]

UDC: 681.142.36:151.1

AN APPROACH TO IMAGE SKELETIZATION

Tashkent IZVESTIYA AKADEMII NAUK UzSSR: SERIYA TEKHNICHESKIKH NAUK in Russian No 3, May-Jun 84 (manuscript received 25 Jan 83) pp 11-15

KAN, V. N. and SADYKOV, S. S., Uzbek Kibernetika Scientific-Production Association, Uzbek SSR Academy of Sciences

[Abstract] A mathematical apparatus is developed which can be used to exttact the skeleton of any image. A set of requirements is formulated which must be satisfied by any extraction operator, whence follows its formal definition. The proposed method can be used to construct the local operator with no a priori assumptions regarding the complexity of the forms

and brightness distribution functions of the original images. The method is advantageous primarily in that it can be used to extract a half-tone as well as binary skeleton. The method can be modified to skeletize real half-tone images. Figures 1; references 10: 3 Russian, 7 Western.
[191-6900]

UDC: 681.142:538.113

COMPUTERIZED SYSTEM FOR INVESTIGATING ELECTRON SPIN-LATTICE RELAXATION TIME AS FUNCTION OF TEMPERATURE

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 3 Dec 82) pp 44-47

DUDKOV, V. N. and MUROMTSEV, V. I., Scientific Research Physical-Chemical Institute, Moscow

[Abstract] A system based on the Elektronika D3-28 microcomputer is described for automating relaxation time measurements in the 4.2-300 K temperature range. The system is used to control the IRES-1001 spectrometer-relaxometer. The method used to measure the spin-lattice relaxation time is explained. The schematic device of the controller and software-controlled attenuator are traced and analyzed. The system speeds up the measurement process by factors of 10-15 and makes experimentation easier. Figures 3; references 11: 8 Russian, 3 Western.
[189-6900]

UDC: 530.107.7

SELF-CONTAINED MEASUREMENT STATION EMPLOYED IN INFORMATION-MEASUREMENT SYSTEM OF GNEYS NEUTRON SPECTROMETER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 14 Mar 83) pp 48-49

GOROKHOV, I. S., LAPTEV, A. B., MARCHENKOV, V. V., TUBOL'TSEV, Yu. V., FOKIN, Ye. Yu. and SHCHERBAKOV, O. A., Leningrad Nuclear Physics Institute, USSR Academy of Sciences

[Abstract] Self-contained systems for making measurements, intermediate storage and display of data derived during experiments implemented in one or several CAMAC crates are described. The system, which is part of the GNEYS ["Gneiss"] neutron spectrometer, can be used for time measurements as well as stand-alone amplitude-weighted time measurements. The stand-alone controller software which has been developed for the measurement system is described. The structural diagram of the system is presented. Figures 1; references 4: 2 Russian, 2 Western.
[189-6900]

UDC: 681.327

MULTICHANNEL DATA ACQUISITION SYSTEM

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 25 May 83) pp 50-52

BASALAYEV, G. V. and GLEMBA, V. I., Physical-Mechanical Institute, Lvov

[Abstract] A multichannel data acquisition system incorporating a multiplexer, two analog storage devices, a double-pole switch, a buffer amplifier, an analog-digital converter and programming device is described which combines good through ut capacity (125 KHz), acceptable accuracy (0.1%), low cost and low power consumption. The schematic diagram of the device is described and analyzed. The system employs a read-only memory controller which permits the sampling program and operating mode of the system to be modified on line. The device provides 16 channels, with an input channel range of -5-+5 V. Figures 3; references 2 Russian.
[189-6900]

UDC: 681.327.22

GRAPHIC ATTACHMENT FOR RASTER CHARACTER DISPLAY

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 10 May 83) pp 53-57

BAKHMATSKIY, V. D., BELYY, V. G., BOL'SHINSKIY, S. M., ORANSKIY, L. G. and POLTAVA, A. N., Special Design Technological Bureau, Donetsk Physical-Technical Institute

[Abstract] A simple device is described which provides graphic capability for standard alphanumeric displays (such as the 15IE00-013). The device can be used to display a 512 x 256-point raster at a rate of 50 frames per second with two gray levels. The graphic display consists of an interface device, an X-coordinate register, a line generator, a frame generator, a control word register, a multiplexer, a control circuit, a read-write control module and a video signal generator. The graphic display can operate in three modes: image generation on the monitor scrren, storage of point image in memory and storage of frame image in memory. The structural diagram of the device is presented, along with schematics of the fundamental modules. Software for outputting graphic data from random access memory of an Elektronika K1-10 computer to the graphic display is described. Figures 4; references 1 Russian.
[189-6900]

UDC: 621.397.133:654.927.2

STEREO VIDEO DISPLAY OPERATOR-COMPUTER FEEDBACK DEVICE

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 11 Jan 83) pp 58-61

MAMCHEV, G. V. and OVSYANNIKOV, P. P., Novosibirsk Electrotechnical Communications Institute

[Abstract] A device which provides feedback from the operator to the computer during observation of stereo television images is described which enhances the perception of the display images by superimposing a system of stereoscopically perceived monitors. Structural and schematic diagrams of the device are analyzed and traced. The relative coordinate measurement error of the feedback system in use at the Novosibirsk Electrotechnical Communications Institute is approximately 4%. Figures 3; references 4 Russian. [189-6900]

UDC: 681.325

DIGITAL SINGLE-SIGNAL RECORDER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 11 Nov 82) pp 61-67

STARODUMOV, V. Ya.

[Abstract] A simple and versatile device for recording signals from 0.1 to 10 μsec long is described. The structural and schematic diagrams of the three-channel device are analyzed and traced. The amplifier can handle input signals of 0.1-1 V of any polarity, and provides gain of 4-400. A pulse-time analog-digital converter with 8-bit resolution, conversion time of approximate 9 μsec or less and error of ±5% is employed. Random-access memory with a capacity of 256 eight-bit words and write cycle of 3.5 sec is used. The device provides measurement accuracy an order of magnitude better than that of a storage oscilloscope. Figures 5; references 8 Russian. [189-6900]

UDC: 681.325.6

PROGRAMMABLE SIGNAL GENERATOR

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 22 Feb 83) pp 67-69

FINAREVSKIY, A. L.

[Abstract] A programmable signal generator for TTL signals is described in which the temporal parameters of the signals can be modified by data taken from storage, or directly from the microcomputer, as well as by means of switches. Structural, functional and schematic diagrams of the device are analyzed and traced. The device can be used to test storage device components and finished electronic circuits. The initial signal phase error for a 100-KHz signal repetition frequency is 0.5%. Figures 3; references 3 Russian.
[189-6900]

UDC: 681.327.11(088.8):539.1.073/74(088.8)

ASYNCHRONOUS-CONTROLLED UNARY-TO-BINARY CODE CONVERTOR

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 27 May 83 after revision) pp 69-74

NIKITYUK, N. M., SAMOYLOV, V. N. and SHYUSSLER, R., Joint Nuclear Research Institute, Dubna

[Abstract] A device is proposed for converting from unary to binary code in which the number of bits output by the device representing the coordinate of the wire of the multiwire proportional chamber is based on the formula $N=\log_2 n$, where n is the number of wires in the chamber. Asynchronous control is employed for internal synchronization and for output data gating. Block, schematic and timing diagrams of the device are analyzed and traced. A CAMAC standard module has been developed for the device, which has 256 inputs, 8 outputs, TTL input and output levels and provides an average conversion time for one coordinate of 100 nsec. The device consumes +6 V·3A and -6 V·0.1A. Figures 4; references 7: 4 Russian, 3 Western.
[189-6900]

UDC: 681.142

DEVICE FOR CONVERTING SEVEN-BIT CODE TO BINARY-CODED DECIMAL AND BINARY

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 19 Apr 83 after revision) pp 74-76

LEONOV, N. P. and SEMERKOV, I. V.

[Abstract] A device for converting 7-bit code to binary-coded decimal and decimal code is described for outputting data from programmable calculators to alphanumeric printers, digital-analog converters and other peripheral devices. The conversion is performed in two stages: the 7-bit code is converted to binary-coded decimal, and then the BCD is converted to binary. The schematic diagram of the device is analyzed and traced. The device has been tested in a regulator for adjusting an antenna-feed circuit. The converter handles input signals of -4.5 and -9 V. The output signal corresponding to a one is +2.4 V or greater. The output signal corresponding to a zero is no greater than +0.4 V.
[189-6900]

UDC: 681.327.11:681.3-181.48

INTERFACING VDT 52106 DISPLAY AND DZM-180 PRINTER WITH ELEKTRONIKA-60 MICROCOMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 18 Feb 83) pp 77-78

DOLGIKH, V. A., STUPENKOV, I. V. and SHINAKOV, V. G.

[Abstract] A device is described for interfacing a VDT 52106 display and a DZM-180 dot-matrix printer with an Elektronika-60 microcomputer. The display and printer are used to replace Consul-260 electric typewriter which serves as the standard computer console. The schematic diagram of the device is presented and analyzed. The maximum data output rate to the screen is nearly 960 bytes/sec; the output rate to the printer is approximately 180 bytes/second. The display, printer and computer are connected by means of the cable supplied with the display. Figures 1; references 4 Russian.
[189-6900]

UDC: 681.327.11:681.3-181.48

DEVICE FOR INTERFACING ELEKTRONIKA-60 MICROCOMPUTER WITH ALPHANUMERIC DISPLAY DEVICES

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 9 Mar 83) pp 78-80

SOROCHINSKIY, V. V. and KHOLODENKO, Yu. N., Special Design-Technological Bureau, Institute of Electrodynamics, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] A device is described for interfacing an Elektronika-60 microcomputer with IMG-1-03 and PIU-1 high speed displays. Both displays can be driven simultaneously by outputting data to the IMG-1-03 in the intervals between the output cycles of data to the PIU-1. The schematic diagram of the interface device is analyzed. Latin, Cyrillic, Greek and special characters can be output to both displays simultaneously. Figures 1; references 3 Russian.
[189-6900]

UDC: 681.518.3

SERIAL INTERFACE EXCHANGE MODULE FOR ISKRA-1256 AND ISKRA-226 COMPUTERS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 11 Jun 82) pp 80-82

STARODUMOV, V. Ya.

[Abstract] A serial interface module for ISKRA-1256 and ISKRA-226 computers based on a programmable serial K580IKI51 communications interface is described. The device makes it possible to connect these computers to more powerful computers, to various peripheral devices and to experimental setups. The schematic diagram of the device is traced, and the operation of the circuit is analyzed. The device can be used for program-controlled data transfer with status register read, transfer with block status testing and transfer employing all input and output operators. References 5: 4 Russian, 1 Western.
[189-6900]

UDC: 681.327

ELECTRONIC EQUIPMENT IN SYSTEM FOR SAMPLING MULTIPARTICLE EVENTS WITH GENERATION OF NEUTRAL STRANGE PARTICLES

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 2, Mar-Apr 84 (manuscript received 13 May 83 after revision) pp 83-87

KRUMSHTEYN, Z. V., LYAYSTE, R., MIKHAYN, Z., TKACHEV, L. G., TON, T., KHOVANSKIY, N. N., KHOMENKO, B. A. and SHELKOV, G. A., Consolidated Nulcear Research Institute, Dubna

[Abstract] Electronic event sampling equipment developed for RISK-spectrometer experiments to investigate the multiple generation of neutral strange particles in adron-adron interactions is described. The sampling system employs information from two scintillation hodoscopes. Structural and schematic diagrams of the device are analyzed and traced. The solution time obtained during tests, defined as the time elapsed between recording the data in the "catch" registers until the Master signal occurs is approximately 150 nsec. Figures 5; references 9: 6 Russian, 3 Western. [189-6900]

UDC: 539.107.5+681.5

EXPERIMENTAL MULTIPROCESSOR SYSTEM EMPLOYING EUROBUS DATAPATH

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 26 Apr 83) pp 62-66

YERMOLIN, Yu. V., MATYUSHIN, A. A. and RYBAKOV, V. G., Institute of High Energy Physics, Protvino, Moscow Oblast

[Abstract] A multiprocessor modular datapath system based on the Eurobus standard is described. The system is comprised of a fixed-priority arbiter module, a multimode datapath display module, a manual controller, a microprocessor module, a memory module and an analog-digital converter. Implementation of the datapath protocal without using special datapath control microcircuits requires substantial hardware (up to half a printed circuit board, which reduces the functional capabilities of the modules considerably). Operation lengths of 500 nsec can be provided easily by the datapath. Multiplexing the address/data lines increases the cycle length; however, it reduces the number of datapath lines. The length of the data transmission cycle is determined mainly by the type of microprocessor employed. The use of synchronous microprocessors and an asynchronous datapath increases the length of the operations. It is important for the address and data word lengths of the microprocessor and datapath to agree. Figures 4; references 4: 3 Russian, 1 Western. [190-6900]

UDC: 621.3.037.7

CAMAC STANDARD STORAGE BUFFERS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 3 May 83) pp 66-68

BYONG, DAO VI, ZHURAVLEV, N. I. and SINAYEV, A. N., Joint Nuclear Research Institute, Dubna

[Abstract] Storage buffers are described which are used to increase the data recording speed in physical research and improve computer utilization efficiency. The performance of KL004 and KL006 buffers, with respective capacities of 64 and 1024 16-bit words, is analyzed. These buffers are used to receive and store data coming from peripheral devices and to transmit the data in file form over a crate datapath. The data are sent over the datapath in the order received from the peripheral device. A system is described which consists of two buffers whose functions alternate during operation, allowing the files stored in one to be output to the CAMAC datapath while the other buffer is being filled. Functional diagrams of the buffers and of the connection of two alternating-function buffers are described. Figures 2; references 9: 6 Russian, 3 Western.
[190-6900]

UDC: 681.327

DEVICE FOR INPUTTING PERIODIC ANALOG SIGNALS TO ELEKTRONIKA D3-28 MICROCOMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 25 Jul 83) pp 69-71

DESHCHENKO, G. N., DRAGUN, V. S. and PANKOV, I. S., Institute of Applied Physics, Minsk

[Abstract] A device is described which converts input signal level samples to 8-bit binary code and inputs the code to an Elektronika D3-28 microcomputer for processing. The system in question is employed for automatic checking of the amplitude-frequency characteristics of two-ports. Schematic diagrams of the analog section, amplification code decoder, control module and gating pulse module are presented and analyzed. The device can also be employed in FM radio signal processing systems. Figures 3; references 3: 2 Russian, 1 Western.
[190-6900]

UDC: 681.327.8

DEVICE FOR INTERFACING V9-5 STROBOSCOPIC VOLTAGE CONVERTER AND ELEKTRONIKA D3-28 MICROCOMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 13 Jun 83) pp 72-74

SNEGIREV, Ye. P., Institute of Spectroscopy, Troitsk, Moscow Oblast

[Abstract] A digital stroboscopic signal recording system based on a V9-5 stroboscopic voltage converter and an Elektronika D3-28 microcomputer is described which incorporates an interface which allows the converter to be controlled by a type of computer and permits data from the converter to be entered in microprocessor memory under software control. Schematic diagrams of the address decoder, converter controller and data input device are presented and explained. The device is employed in the digital stroboscopic recording system of a high-resolution infrared-band spectrometer employing pulsed diode lasers. The use of digital recording methods improves the sensitivity of the spectrometer and speeds up the spectrum recording process. Figures 2; references 3 Russian.
[190-6900]

UDC: 681.124.62

INTERFACING SP-3 PAPER TAPE READER AND ELEKTRONIKA-60 MICROCOMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 27 May 83) p 75

SASUNKEVICH, V. A. and KOCHKOV, I. A., Pacific Ocean Institute for Bioorganic Chemistry, Vladivostok

[Abstract] A method is presented for connecting an SP-3 paper tape reader to the V1 device and an Elektronika-60 microcomputer with practically no changes to the data amplifier circuit. Schematic diagrams of the data amplifier and tape movement controller are presented. An SP-3 paper tape reader is modified by the method described allows data to be input to the Elektronika-60 through the V1 device at rates of 200 lps. Figures 2; references 3 Russian.
[190-6900]

UDC: 681.328.11

INTERFACING F595 TRANSCRIBER WITH DYNAMIC READOUT DIGITAL MEASURING INSTRUMENT

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84
(manuscript received 11 May 83) pp 76-77

PILIPYUK, O. I. and TROFIMENKO, I. T., Department of Physics, Moscow State University

[Abstract] An attachment is described for interfacing an F5007 reversible counter (which outputs data dynamically in serial-parallel code) with an F595 transcriber for an EUM-23 alphanumeric printer (which receives data in parallel code). The attachment matches the information levels of the voltages of both devices and allows the bit of the digital measuring instrument enabled for printing in the transcriber to pass serially. The device is powered by the transcriber and is connected to its test terminal on the back panel. An analogous arrangement can be employed to match the F595 with 2 or 3 dynamic-readout digital measuring instruments, or with a mixed set of instruments. Figures 2.
[190-6900]

UDC: 681.327

DEVICE FOR INTERFACING KVARTS-1 DISPLAY WITH CAMAC CRATE DATAPATH

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84
(manuscript received 7 Apr 83) pp 77-80

PIKHUN, V. N. and USTINOV, A. G., Institute of Electronics, Belorussian SSR Academy of Sciences, Minsk

[Abstract] A device is described for connecting a KVARTS-1 alphanumeric display to a CAMAC crate datapath. Two methods for exchanging data between the display and the CAMAC datapath are described: in one method, codes corresponding to the display input/output instructions can be sent from the datapath. In the second method data exchange is performed under the control of standard CAMAC instructions, and the KVARTS-1 input/output instructions are generated in the interface device. Data exchange between the display and the CAMAC datapath is performed in 8-bit parallel code at an average rate of 500 cps. The functional diagram of the proposed device is presented and analyzed. The device employs 40 series-155 microcircuits, and a K155RE3 read-only memory circuit. The device consumes less than 1 A from a +6V source. Figures 2; references 2 Russian.
[190-6900]

UDC: 681.3

USE OF VT-340 (VDT-52100) DISPLAY AS ELEKTRONIKA 100-25 COMPUTER OPERATOR CONSOLE

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 3 Jun 83 after revision) pp 80-82

KOSHECHKO, N. M., Central Economic-Mathematics Institute, USSR Academy of Sciences, Moscow

[Abstract] A simple method is described for replacing the standard Consul electric typewriter with a video display device retaining all of the functions of the typewriter keyboard. A VT-340 display was employed; however, a VDT-52100 can be used as well. The display is connected to computer through a standard breadboard module and an MRN-22 connector. Information is exchanged between the display and the input/output device in 7-bit parallel KOI-7 code through a VD-14 (VDT-10-1) parallel interface module. Replacing the typewriter with a video display increases the information transfer rate between the operator and the computer, and improves the utilization of computer resources and central processor time. Video terminals also support data preparation and editing modes, which are not possible in principle on printing devices. Figures 1; references 4 Russian. [190-6900]

UDC: 681.327.11:681.3-181.4

DEVICE FOR INTERFACING ELEKTRONIKA-60 MICROCOMPUTER WITH VTA-2000 DISPLAY AND ELEKTRONIKA D3-28 MICROCOMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 6 Jun 83) pp 82-85

ZAYSHLYY, Ya. S., KRAVTSOV, V. R. and SHABIVOVK, Yu. B., Lvov Polytechnical Institute

[Abstract] A circuit is described for interfacing an Elektronika-60 microcomputer with a VTA-2000 display and an Elektronika D3-28 microcomputer to serve as an external storage controller. In the proposed arrangement, the Elektronika D3-28 is connected through parallel transfer device I2, and the display is connected through the standard V1 controller. Schematic diagrams of the device are presented and analyzed. The capability of using the standard Consul-60 electric typewriter is retained. The maximum data exchange rate between the computer and the VTA-2000 display is 50 bytes per second; the maximum exchange rate between microcomputers is 500 K bytes/sec. The use of the Elektronika D3-28 microcomputer also makes it possible to employ magnetic tape storage. Figures 2; references 4 Russian. [190-6900]

UDC: 681.327.11:681.3-181.48

INTERFACING ELEKTRONIKA K1-10 MICROCOMPUTER WITH DARO-1156 ALPHANUMERIC PRINTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 3, May-Jun 84 (manuscript received 16 May 83) pp 85-87

GUDYMENKO, S. V., GURTOVTSEV, A. L., GURCHIK, M. Ye. and KHOLYAVENKO, V. G., Belorussian Branch, Power Engineering Institute, Minsk

[Abstract] A method is described for interfacing the Elektronika K1-10 microcomputer with the DARO-1156 alphanumeric printer, making it possible to increase the printout rate by a factor of 10. The printer is connected directly to the microcomputer: with inversion through the microcircuits of the bus drivers and through the peripheral parallel adaptor microcircuit. The software character output driver contains 37 ASSEMBLER-80 instructions and operates at approximate 90 μsec. The method can be employed in any microprocessor systems based on the K580IK80 microprocessor. Figures 2; references 3 Russian.
[190-6900]

ADVANCED SOFTWARE DEVELOPMENT TECHNOLOGY

Moscow EKONOMICHESKAYA GAZETA in Russian No 8, Feb 84 p 16

[Article by V. Myasnikov, professor and member of the USSR State Committee on Science and Technology: "The Capabilities of R-Technology"]

[Text] Extensive automation of production processes based on the application of high performance machine tools, machinery and mechanisms as well as robot systems and computer hardware is cited as one of the major directions for the acceleration of scientific and engineering progress in the decree of the CPSU Central Committee and the USSR Council of Ministers. Because software for computers as well as automated systems and data processing systems now belong among industrial products, the questions of creating new technologies and production process complexes as well as their planning take on especially great importance.

About 20 tasks involving the development of progressive technologies, production process systems, procedural materials and recommendations for the mastery and application of technologies and methods for software design are incorporated in the programs for the resolution of the most important scientific and engineering problems. One of the most promising of these is the technology which has been given the symbolic prefix R.

R-technology was created in the Institute of Cybernetics imeni V.M. Glushkov of the Ukrainian SSR Academy of Sciences. It is characterized by the following series of fundamental aspects which differentiate it from the well-known domestic and foreign technologies:

--The use of a graphical form for writing the algorithms and the processes of their development; the incorporation of the concept of a drawing in the programming;

--Programming in informal symbols with automatic setting of formal relationships between them;

--A paperless scheme for operation in an electronic mail interactive network with automation of the control of the organizational activity of the staff of programmers; the formalization of assignments and the automatic monitoring of their fulfillment.

The USSR State Committee on Science and Technology has recommended at the beginning of the 11th Five-Year Plan the RTK production process system along with other complexes (TKP, PRIZ) for priority implementation with the YeS unified computer series for the purpose of improving the labor productivity of programmers. Those production process systems which implement R-technology have been developed in accordance with the tasking of the scientific and engineering programs for the major Soviet made computers: the unified series and the system of small computers, the BESM-6 and the "Elektronika NTs 80-20". Considerable experience has already been acquired in the efficient utilization of R-technology and RTK production complexes in various areas of computer hardware application.

Experience with the use of R-technology and RTK systems provides evidence of an increase of 200 to 300 percent in the labor productivity of programmers, and an even greater improvement in individual cases. Since 1981, the RTK production process system for the operating system of the Unified System of computers has been included in the catalog of centrally supplied software for Unified System computers, and in 1983, it was incorporated in the standard delivery set of software for all computers in the unified series. About one-thousand deliveries of RTK production process systems for the operating system of the unified computer series have been made at the present time.

Deliveries of the RTK production process complexes for the system of small computers and the MIKRO RTK in accordance with user requests will be started in 1984 and the issuance of the standard "YeSPD.R - Algorithm flow charts, programs, data and processes. Symbols and graphics and rules for execution" is planned.

A number of measures were recommended in the resolution of the first all-union conference on "R-technology for programming" (September 1983) for the fastest possible implementation of this progressive method. In particular, provision is made for incorporating the course "programming technology" (including R-technology) in the teaching programs of the higher educational institutes.

The further extensive introduction of RTK production process systems for various types of computers will promote an improvement in the efficiency of software design as a product of production engineering for numerous sectors in the national economy.

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UDC 681.3.06

ADJUSTABLE INSTRUMENT COMPLEX FOR DEVELOPMENT OF SYSTEMS IN BIT-SLICE MICROPROCESSORS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 84 (manuscript received 12 Apr 83) pp 36-39

[Article by O. I. Semenkov, L. A. Grinshpan, Ye. M. Zlotnik, Ya. T. Malyush and D. R. Sherling]

[Excerpts] Introduction. Effective development of the hardware and software components of microprocessor systems requires the presence of special instrument complexes that automate the processes of program production and hardware debugging. Known devices of this type include ICE-3000 systems of the INTEL Company, SYSTEM-29 of the AMD Company and so on.* Each of the automation systems is characterized by specific functional capabilities (i.e., it is oriented toward a specific class of microprocessors, it executes a limited number of operations, it is based on specific types of hardware and so on).

The universal distribution and vigorous development of microprocessor technology generates such a wide range of user requirements on the capabilities of these systems that no one of them is capable of satisfying these requirements completely. In this regard, there is a constant chronic lag in development of automation systems behind the needs of practice. The problem of developing instrument complexes for devices based on bit-slice microprocessors is especially timely, since the principle of microprogramming on which they are based requires development of a unique symbolic language and of a translator from it for each newly developed device.

The METAMIKRO adjustable instrument complex for development of systems in bit-slice microprocessors, distinguished by the following characteristic features and created at the Institute of Technical Cybernetics, BeSSR Academy of Sciences, is described in this article:

maintenance by the complex of processes of development of the hardware and software components of microprocessor systems;

* A. B. Liberov, "Computer-Aided Design Systems for Microprocessor Devices," in "Radioelektronika v 1980 godu" [Radio Electronics in 1980], Moscow, NIIEIR, 1981, pp 35-48.

the presence of adjusting devices to symbolic microprogramming language developed by the user;

simplicity of defining the symbolic microprogramming language;

automatic generation of translators from symbolic microprogramming languages that provide high productivity;

real-time realization of microprogram and hardware debugging stage using a firmware bench (APS);

independence of APS software from the type of microprocessor set used in the system to be debugged.

Composition and organization of operation of METAMIKRO system. The METAMIKRO instrument complex consists of the following components (figure):

program-generator of translators;

adjustable translator from symbolic microprogramming language;

firmware bench for real-time debugging of microprograms and hardware;

a program monitor that controls the operation of the bench.

Generation of translators and of translation itself are accomplished in a YeS cross computer. Debugging is carried out by using an APS executed on the basis of the Elektronika-60 microcomputer. Any mini- and microcomputer having the same instruction system can be used instead of this computer. The unit to be developed is connected to the APS.

Working with the METAMIKRO instrument complex consists in realization of the three following phases: the phase of adjustment to the symbolic language, the phase of writing and translation of microprograms and the phase of debugging the microprograms and hardware.

The first phase begins with development of the symbolic microprogramming language.

The definition of the symbolic language is entered in the program generator, which adjusts the translator to work with this language. The translator is adjusted during one execution of the program generator. The generated translator is used in the translation phase to translate the symbolic microinstructions to binary form. The result of the work of the translator is a papertape with microprogram in binary code and a text of the microprogram, formulated according to the requirements of YeSPD [Unified System of Program Documentation]. The paper-tape containing the microprogram is used in the debugging phase. It is entered in the APS and is executed in the mode given by the operator. The operator has at his disposal 13 commands that permit effective debugging of the microprograms and hardware.

Debugging of microprograms and hardware. The papertape with the binary microprogram codes, produced as a result of the work of the translator, is entered in the APS. The debugging phase begins at this moment.

The APS is executed on the basis of the Elektronika-60 microcomputer and includes an alphanumeric display, papertape input-output devices and adapter for integration with the unit to be debugged. The integration adapter contains a two-port main memory (OZU) with organization of 1 K X 64 bit and monitor and control circuits. The microprograms to be debugged and the tests for debugging the hardware are loaded into the main memory. The adapter is connected to the system to be debugged instead of its read-only memory and controls the operation of its synchronous generator. The APS is supplied with a tracing memory with capacity of 16 32-bit words that permit one to check the status of 32 points of the hardware during the most recent 16 cycles of its functioning. The contents of the tracing memory are displayed on the screen in the form of a binary code. The unit states of the cells of the tracing memory reflect high potentials at the monitored points and zero states reflect low potentials. The bench operates under the control of the program monitor, which occupies 8 Kbyte of the main memory of the microcomputer, and permits execution of the microprogram in four modes:

in automatic mode with start from a given address;

in automatic mode with start and stop by given addresses;

in automatic mode with start from a given address and stop by event;

in the step mode, beginning with a given address.

The last two modes permit effective monitoring of the correctness of operation of the hardware and detection of its malfunction. The capability of multiple execution of any microinstruction is useful in debugging of hardware.

The commands of the bench permit one to read any cell of the main memory in a binary or octal number system and also to modify their contents. It is sufficient to give the address of the first microinstruction and to press the VK (return) key after output of each routine microinstruction to the screen to read sequentially arranged microinstructions. After the next number of the microinstruction address or any of its fields has been entered, the ordinal number of this number is called to the screen. The probability of operator error is thus reduced. The program monitor checks the actions of the operator and prints the character "?" on the screen if an error is detected.

The commands of the bench permit one to read the contents of the general-purpose registers, the status word of the microprocessor, to print any domain of the emulating memory, to store the contents of this memory by output to papertape and also to measure the times of execution of different branches of microprograms using a timer built into the bench.

Conclusions. The METAMIKRO system underwent experimental operation and is now being used to develop microcontrollers based on series KR1804, designed to

control graphic input-output devices (vector and raster displays, input plotter and so on). The experience of operating the complex showed that it provides a significant reduction of the periods of development of microprograms and hardware of systems in bit-slice microprocessors of different types.

The APS can be made up of adjustable disassembler and interpreter to increase the efficiency of the METAMIKRO system. This permits, first, debugging, by operating in symbolic microprogramming language, and second translation of symbolic microprograms to binary form directly on the bench. With this make-up, the bench is transformed to an individual automated work station of the developer of microprocessor equipment.

The authors feel it is their duty to note the important contribution of V. V. Bokutya and Ye. Ye. Tkachev to development of the METAMIKRO system.

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APPLICATIONS

PROGRESS IN COMPUTER APPLICATIONS IN THE LITHUANIAN SSR

Vilnius SOVETSKAYA LITVA in Russian 20 Jan 84 p 4

[Article: "Computers in the Service of the National Economy"]

[Text] Electronic computers (EVM) and automated data processing systems have been making ever greater inroads into various sectors of the national economy in recent years. They are finding extensive applications in science in various areas of fundamental research and in the practical utilization of their results, in processing diverse experimental data, retrieving patent and factual information. Computer hardware is used in production for the resolution of complex engineering problems as well as the control of production processes. The efficiency of all links in the national economy and improving labor productivity today depend in many respects on the application of computers and mathematical methods of processing, retrieving and storing information.

Serious attention is being devoted to the use of computer hardware for the solution of problems in science and production tasks in the Institute of Mathematics and Cybernetics of the Lithuanian SSR Academy of Sciences. The deputy director of the institute for scientific affairs and corresponding member of the academy of sciences of the republic, Laymutis Tel'ksnis, discusses the work of the scientists here.

Work has been underway for a quarter of a century now in our academy of sciences on the use of computers in scientific research. The first computer center in Lithuania began operation in 1962 in the Institute of Physics and Mathematics, later changed to the Institute of Mathematics and Cybernetics. Incidentally, even then its services were used by industrial workers in addition to the scientists. This fine tradiation has continued up to the present day and is yielding good results.

The capacity of the computer stock has increased from year to year, and the techniques of using them have also been refined at the same time. Thus, through the efforts of the staff of our institute, a so-called terminal network of computers was developed for the first time and operation of the terminals (hardware for interfacing man and computer in an interactive mode) was started, where the terminals were tied to the computer through telephone communications channels. The use of interactive operation with computers

has made it possible to reduce the debugging time for the new programs which are being developed by a factor from 3 to 10 times. Some 70% of the tasks are handled in this way at the present time. Techniques have also been developed for utilizing computer display graphics. A terminal has been placed in service whose utilization can provide information stored in computer data banks in Moscow and a number of foreign countries.

We have started a qualitatively new stage of computer use for scientific research purposes following the operational acceptance of the first stage of the collective-use computer system of the Lithuanian SSR Academy of Sciences. It is abreviated as "Mokslas" and has been equipped with a number of high performance computers. This system is used by a large staff of members from numerous institutes in our academy, as well as 15 teaching, scientific, design and production organizations and institutions in the republic. The "Mokslas" computer system daily handles about 1,000 computer tasks and program debugging jobs.

A great deal of work has done in the area of creating new as well as adapting and using existing computer software; several program packages have been designed. For example, software has been created for the solution of nonlinear differential equations, optimization problems, the selection of classifiers for random observations, the analysis and synthesis of random processes as well as cardiac rhythm analysis. A set of programs has been developed for the planning of scientific research and prototype design efforts. Programs for data base management systems have also been studied and implemented.

The methods of using computer hardware which we have developed are utilized by production workers, designers, workers from other scientific institutes and higher educational institutes, students and those attending the intermediate schools of the republic. The knowledge and experience gained in the field of writing and adapting programs also find applications and are disseminated throughout the republic. For example, the results obtained from a study of a number of data base management systems and the software for accessing them were forwarded to 17 organizations which design data banks. Urgent problems of automating medical processing are being solved in close cooperation with physicians. Three books have been published which are devoted to programming languages. Exercies are being held for the fourth year at the republic school for young programmers.

Despite the definite successes in the area of utilizing computer capacities, science and engineering are confronting computers with new complex problems. This five-year plan calls for expanding the capabilities of the "Mokslas" system by means of bringing the "El'brus" multiprocessor computers on line, which represent fourth generation computer hardware. The YeS-2345 matrix processor will be placed in service this year. Considerable attention will be devoted to the use of convenient and comparatively inexpensive mini- and microcomputers.

Later, it is planned that the "Mokslas" computer system will be tied into the "Akademset'" ["Academic Network"] of the union republics and the USSR Academy of Sciences computer system.

Further refining the methods of utilizing computer hardware and building up the stock of computers will make it possible to boost the labor capacity and productivity of scientific and production workers.

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SECTORAL AUTOMATED MANAGEMENT SYSTEM PROBLEMS

Moscow PRAVDA in Russian 2 Feb 84 p 3

[Article by R. Levita, candidate of economic sciences and Yu. Orfeyev, candidate of philosophical sciences, Moscow: "Having Thrown Out Savings on Paper; Problems and Discussions"]

[Text] Automated control systems have been actively employed in the national economy for about 20 years. Their are already thousands of them. It is true that systems of various classes are subsumed under the general designation ASU [automated control system]. The word "control" is ambiguous. We say that an operator controls a rolling mill, while a minister controls a sector, although the differences are obvious here: in the first case, the issue is one of manipulating a technical device, while in the second, the issue is one of managing staffs of people and the abreviation ASU has more of a metaphorical character in the latter case.

Automated control systems can and must be broken down into two types, depending on which systems are subjected to control automation: production processing or organizational systems. In the first case, the set of inputs is known beforehand and is comparatively small, while the response of the machine to them is knowingly predetermined. More than half of all of the ASU's in the nation are used for automated control systems for production processes (ASU TP). But many tasks handled by ASU's for enterprises and associations belong essentially to the same type, for example, the automation of the generation of schedules and routes for cargo transportation.

The control of economic and social processes is of an entirely different nature. Here one must deal with tasks, which as a rule, cannot be subjected to strict formalization. The decisions which are made, especially those concerning the future, are far from trivial, and the reaction of staff workers to these decisions is not at all unambiguous. The notion that a set of models of different situations which are encountered in practice can be placed in a computer memory and the desired solutions called up on a display screen by pressing a button is an illusion.

Does this mean that there is no place at all in this area for automation? Of course there is. But the issue involves the automation of primarily the most frequently repeated operations and work processes, which can be

formalized. A classical example here can be the ASU's for ministries and departments, usually called sector level ASU's, the number of which is already approaching 300. Just what are they?

An OASU [sectoral automated management system] is a system for the automated retrieval and processing of information for control needs. They usually process bookkeeping, statistical and similar information, retrieve, store, update and output norm data, as well as calculate variants of plan drafts taking into account the specified limitations. Management though in the inherent sense of the word is a creative process, including the selection of goals and criteria for the development of a sector and its subdivisions, decision making, and the implementation of the mechanism for executing the decisions. An OASU cannot take this on itself.

What-is-desired is passed off here as reality. No substantial changes have been made in computer management of the sectors: neither the methods of management nor the organizational structure have been changed. Sector management has not become automated (and really cannot become so), since the computers take over operations which do not comprise the essence of this process.

We foresee objections: what is the significance of these arguments? Isn't this an empty game of definition here? The fact is that an important and severe problem of evaluating OASU efficiency is concealed behind the terminological fine points.

If an OASU is a control system, then its effectiveness is defined in terms of the results of the production-economic activity of the sector. However, if an OASU is an automated data retrieval and processing system for the needs of management, then efficiency is measured here in terms of the extent to which the information demands of the organization are satisfied.

Existing OASU's are actually information systems rather than control systems. Computer centers are designated as the organizations to which OASU operation is entrusted; computer center obligations do not include sector management. But in contradiction to reality, the authorized procedure for estimating the economic efficiency of OASU's treats them specially as sector control systems. Taken as the basis for this document is the calculation of the savings attainable in production management activity through the use of mathematical techniques and computer hardware. However, the calculations and reports in accordance with this procedure are required, no matter how strange it seems, not from the staff of the ministry, but rather from the organizations engaged in information retrieval and processing.

Automating data processing for control in and of itself does not improve and cannot improve the production and economic results of a sector. Computer centers provide updated and reliable information for decision making. The actual economic savings though depend on how this information is used. To estimate the output of an automated data retrieval and processing system using this procedure is tantamount to assessing the operational indicators of X-ray equipment from the results of the operation of a surgeon to whom the X-ray photographs are made available.

Of course, sector successes depend on the timeframes and quality of the data processing for management needs. But this is not a direct dependence, and it cannot, as a rule, be expressed quantitatively.

The adopted procedure is not only poorly suited to present day OASU's, in our opinion, it is also harmful. Where there are no objective criteria for calculating the anticipated or produced effect, a broad gap is opened up for just making the figures fit using the method "and how much do you need?" It is difficult to take seriously the data which wander from one document to another: after operational acceptance of some particular OASU, the product output volume for that sector increases while the consumption of materials drops by 0.5 percent. Why by 0.5 and not by 0.7? It is useless to look for an answer to this question in the documents: everything has been established using the technique of expert opinion. According to the data of the All-Union Scientific Research and Planning Institute for OASU's - the chief organization for the development and implementation of sector level systems, their average pay-off period is one year. In order for a system to be assigned to the highest scientific and technical level group, the annual savings should be no less than 20 million rubles. Who more modestly and more cautiously shows 5 million rubles annually, while systems running ahead of progress, for example, such as the light industry OASU's lay claim to 20 million rubles of savings with an investment pay-off period of less than half a year. Both the 5 and the 20 million rubles are unprovable. These are paper savings.

Attempts are being undertaken not to allow overstatments of the data by means of obligatory confirmation of the economic impact by managers of the functional administrations of a ministry or all-union industrial association. This does not lead to anything other than prolonged arguments between the ASU designers and the management staff personnel, since neither one nor the other has at their disposal substantiated methods of calculating the savings which can be attained in production through the automation of data retrieval and processing.

The procedure also has yet another flaw. In both its letter and spirit, any OASU subsystem is acknowledged as inefficient if its introduction is not accompanied by an immediate improvement in the technical and economic indicators of the sector. In reality, these indicators depend on a multiplicity of factors. Even if management on the part of the ministry was improved through the refinement of the information support, this will not necessarily be immediately reflected in the operation of the enterprises.

The lack of clear-cut substantiation for the economic impact of an OASU early on generated mythical figures for savings and the ultrafast pay-off of the investment. A rush is now being observed to the other extreme: the denial of any effectiveness for sector level ASU's, claims that they do not justify themselves.

In actual fact, the information requirements of production managers in modern times can practically never be satisfied by traditional methods. Under these conditions, automation of data processing is one of the requisite conditions for enhancing the scientific substantiation of administrative decisions. A

set of examples can be adduced which confirm the validity of this assertion. In these cases, ASU's come out as a reliable and irreplaceable tool. But their usefulness and effectiveness apparently cannot be evaluated using the adopted procedures.

And can OASU efficiency be measured in general? Even with all of the differences between sectors, the obligations fulfilled by administrative personnel are pretty much of the same type. The demands for a significant part of the information are also similar. Operational experience with OASU's makes it possible to set up standardized sets of tasks for information processing for management needs. They consist of two parts: the tasks obligatory for all sectors and the tasks typical of a group of sectors, for example, machine building.

As is well known, efficiency characterizes the ratio of the results obtained and the expenses required to attain them. For this reason, standards are needed for the development and operation of a standardized set of tasks. By comparing the actual expenditures for the preparation and implementation of a particular set with the norm values, one will be able to better judge the achievements of a specific ASU.

The development of standardized sets of tasks is quite a feasible matter and will serve as a real incentive for using standard design solutions in the construction of OASU's, and enhance the efforts made to automate information processing.

One important circumstance must be taken into account in this case: automation by means of computers should not lead to a significant increase in the cost of information processing as compared to traditional methods. The transition should be made to the new technology only in the case when it is either actually less expensive or significantly accelerates the performance of the operation. Unfortunately, these obvious rules are frequently not observed, and the transition to automated processing is forced in an unjustified and artificial manner, forgetting about the considerable expenditures for computers, software and operational costs.

We will note again and once again that negative effects can in no case cover up the undisputed expediency of OASU's. But the creation of them must not be a tribute to style, but rather a consequence of the scientific analysis of the information requirements of a management staff.

The widespread skepticism regarding ASU's is due, from our point of view, to the fact that during the 1960's, excessive hopes were tied to their introduction. It appeared to many during the "cybernetics boom" that nearly all problems of boosting management efficiency could be resolved by means of ASU's. A consequence of this was their hurried construction in those areas where there was still no "internal demand" for them.

We feel that the time has passed for making noisy promises on behalf of computers for everything in the area of management and the undemonstrable

many millions of income from ASU's. Instead, there should come a sober estimate of the expenditures and the fruit derived from this, as well as vigorous actions directed towards enhancing the actual efficiency of information systems.

8225
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AUTOMATION OF METHOD OF PROCESSING INFORMATION AT COLLECTIVE-USE COMPUTER CENTER

Moscow VESTNIK STATISTIKI in Russian No 3, Mar 84 pp 49-53

[Article by V. Sisko, group leader, and V. Chizh, deputy director, Republic Collective-Use Computer Center, Estonian SSR TsSU [Central Statistical Administration]]

[Text] The purpose of developing collective-use computer centers (VTsKP's) is the more efficient utilization of computer technology, as well as complete satisfaction of the center's users in data processing and computing work. A VTsKP as a rule is furnished with a system of jointly functioning computers, data communication facilities and a user network, which, together with the appropriate software and information facilities make it possible for users, regardless of the department they belong to, to make collective (local and remote) use of computer resources, programs and information banks. With this, the simultaneous and independent servicing of VTsKP users is made possible.

In development of the VTsKP for the Estonian SSR TsSU it was decided that its hardware base had to be constructed on the basis of a multicomputer computer system consisting of several YeS [Unified Series] computers. The goal was set of making maximum use of the capabilities of YeS computers and system software. In keeping with this, a 3-computer system was developed, based on YeS-1033 computers formed into a system via channel-channel adapters (YeS-4060's) and a common disk storage field. The "Multicomputer Job Entry Subsystem" package of application programs (PPP ROS) was used as the basic software, as well as software developed at this center and designed for the total completion of work, beginning with the formation of monthly schedules for the preparation and processing of information and ending with accounting for work performed and settlements with users. All the software is represented in the "Automation of the Production Process of Information Processing at a VTsKP" project, consisting of four subsystems: planning of work in VTsKP services, planning of jobs in a multicomputer system, gathering and processing of data on utilization of the resources of a multicomputer YeS computer system, and settlement with users for work done.

The "Planning of Work in VTsKP Services" subsystem makes it possible to form monthly schedules for solving problems in the prescribed quantities and within

the deadlines set, and 24-hour schedules for each VTsKP service, including the departments for preparing and outputing statistical information, for preparing data for entry into a computer, etc., keeping task logs, as well as specification and reference information required for functioning of the subsystem.

The 24-hour schedule, formed on a magnetic disk within the framework of the subsystem, for the accomplishment of planned work is the basis for performance of the regulation jobs of the "Job Planning in a Multicomputer System" subsystem.

This subsystem makes possible the following: 1) formation of a file of scheduled jobs; 2) formation of the order of these jobs for a 24-hour period; 3) starting of jobs by the time designated with an indication of the time of completion; 4) formation of the general sequence of scheduled and non-scheduled jobs; 5) efficient utilization of computing capacities; 6) centralization of control of the course of the computing process; 7) increasing the priority of jobs as the deadline set approaches.

The first three functions are made possible by newly developed software, the fourth by newly developed software and PPP ROS facilities, and the remaining by just the facilities of this package.

The "Gathering and Processing of Data on the Utilization of Resources of a Multicomputer YeS-Computer System" subsystem makes it possible for VTsKP operating personnel to obtain information on the state of hardware and progress in the completion of jobs, as well as to gather data for settlement with users for the use of the computing resources of a multicomputer system. The basis of this subsystem is work on the development of an automated system for accounting for the use of resources. Data are gathered by means of a system monitor program and programs for recording the errors of input/output units and the processor, and channel errors.

After the gathered data are processed, tables are output which characterize the implementation of jobs per shift or per a specific time interval, as well as tables containing information on errors in the operation of hardware. For the purpose of planning work involving the servicing of equipment, the statistical characteristics of errors are calculated, in particular, the mean number of errors over a specific time interval, the standard deviation of the number of errors, and also the probability that the number of errors per unit of time in an individual unit will be higher than the prescribed value. For the purpose of evaluating the quality of preventive maintenance work, a calculation is made of the mean number and standard deviation of the number of errors in the computer as a whole and in its individual units as a function of the time which has passed since completion of the last preventive maintenance, and individual bar graphs are constructed.

The "Settlement with Users" subsystem makes the following possible: the formation of tables for accounting for machine time used by means of job codes, as well as tables characterizing computer downtime and losses of computer time for various reasons; calculation of the cost of work performed on the

computer in terms of tasks, contracts and users; formation of documents for the receipt and delivery of work and of information for reporting on the work of the VTsKP on form No 1-mekhschet [mechanized reporting]; processing of data of operating recording of the output of operators involved in preparing data for the computer and the operators of punched-media and keyboard computers; and calculation of the amount of work performed on punched-media and keyboard computers and in the preparation of data for entry into a computer.

The set of programs for settling with users for work performed on computers provides for two alternatives for the entry of information on the utilization of computer time: from punched cards, prepared on the basis of a journal for keeping records of the computer's work, and from magnetic media prepared by the programs of the subsystem for gathering and processing data on the utilization of the resources of a multicomputer YeS-computer system, based on information gathered by the system monitor program.

The main technological advantages of the method selected for organizing the computing process are realized with the direct performance of work in a multicomputer computer system. Therefore, let us discuss in greater detail the organization of work at precisely this production process stage. The computers included in the multicomputer system are functionally specialized (fig 1). One of them performs the role of the servicing computer, and the remaining are considered the principal computers.

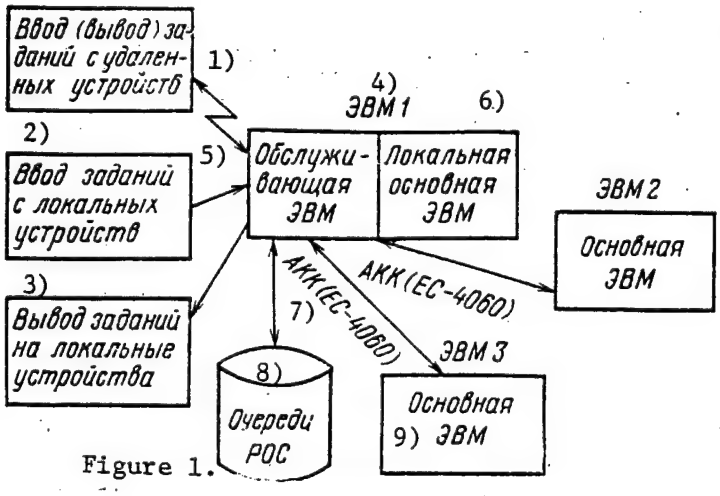


Figure 1.

Key:

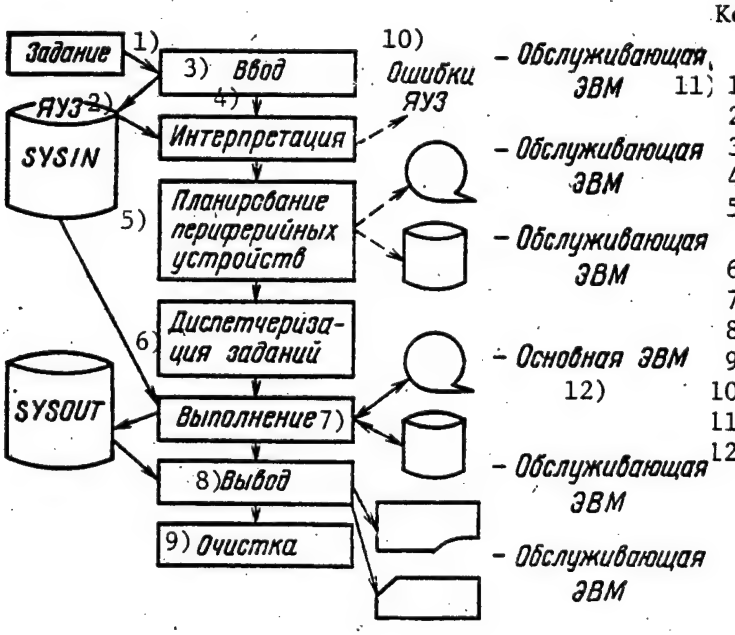
1. Input (ouput) of jobs from remote units
2. Input of jobs from local units
3. Output of jobs to local units
4. Computer No 1
5. Servicing computer
6. Local principal computer
7. AKK [channel-channel adapter]
8. ROS waiting lines
9. Principal computer

The practical implementation of tasks under conditions of the configuration of the system represented in fig 1 can consist, for example, in the following. In the first principal computer, interfaced with communication channels, problems in the teleprocessing of statistical information on the basis of STOSI [Statistical Information Teleprocessing System] facilities can be solved; in the second, problems in the processing of which the ISKHOD [Integrated Information Storage and Processing System] of the ASGS [Automated System for State Statistics] ABD [data bank] is used; and in the third, EOI [electronic data processing] systems are implemented. In keeping with this, the first computer

is designed for remote access, the second for information reference services, and the third for batch processing. Background tasks can be executed on all three computers. Taking this into account, let us discuss the functions of the servicing and principal computers.

Units (local and remote) enabling the entry of jobs into the system and the output of results and information on their completion are connected to the servicing computer. All input and output information passes through the servicing computer. The sequence of ROS jobs is formed and maintained on magnetic disks. The servicing computer reads the stream of jobs and places them in the ROS waiting line and distributes work among the principal computers. Thus, the jobs arriving for processing have total access to the resources of all computers included in the multicomputer computer system. It must be noted that the servicing computer occupies only part of the resources of one computer of the system. The functioning of a local principal computer is organized on the basis of the remaining resources of this computer. AP-4 user stations or other YeS computers operating under the control of special software can be connected as remote input/output units of the servicing computer. The remote batch processing mode is thereby implemented. The principal computers operate under control of their own operating systems, into which a special module for communicating with the servicing computer is loaded.

Let us discuss the features of programming and the control of jobs in a multicomputer system, using the example of feed-through of a standard job to be performed in seven steps (fig 2). The steps of the programming of peripheral devices and the dispatching of jobs determine the rationale for development of the ROS. All steps are accomplished on the servicing computer, and only one--execution--on the principal computers.



Key:

1. Job
2. YaUZ [job control language]
3. Input
4. Interpretation
5. Programming of peripheral devices
6. Job dispatching
7. Execution
8. Output
9. Clearing
10. YaUZ errors
11. Servicing computer
12. Principal computer

Figure 2.

The first stage is called input. During this time, jobs are read into ROS waiting lines from local or remote input units connected to the servicing computer. Jobs can be input from input units--from punched cards, magnetic tape, a disk storage, and remote input units--and by means of the processing of interal jobs, (e.g., a job received from time sharing operation). During reading of a job, ROS control charts are processed, check units are constructed for the job, and the input data of the job (SYSIN) are placed into ROS waiting lines.

Then comes the interpretation step. Job control language (YaUZ) charts are read from ROS waiting lines and are interpreted by means of YeS operating system facilities. Errors in the job control language result in implementation of the output and completion step. Then the catalogue is scanned for catalogued sets of data and information is accessed from YaUZ charts for the step of programming of peripheral units. At this step, for the purpose of performing the next job, the required disk and tape storages intended for the principal computer are placed on standby, messages are output for the mounting of volumes, the correctness of their mounting is checked, and the peripheral devices are freed after completion of the job. This step is necessary for the following reasons: The YeS operating system programs volumes only step by step (because of which there can be a delay in implementation of a job if the required resources are lacking); the YeS operating system is designed for the operation of only one computer; therefore, delays can originate in the implementation of jobs when it is necessary to use similar volumes in different computers; the preprogramming of units makes it possible to make more efficient use of disk and tape storages.

In the dispatching step, jobs ready for execution are transferred to the principal computers in a sequence making it possible to make better use of the resources of the processor and memory. The job completion step is accomplished in the principal computers. During this time, SYSIN data sets enter the principal computer via a channel-channel adapter and output (SYSOUT) sets are entered into the ROS waiting lines of the servicing computer. The output step makes it possible to process data sets which can be transferred to local and remote printout and punch units or for the purpose of further processing in the time sharing mode (RRV). After this comes the completion step, in which all resources dedicated to the job (volumes, units and spaces in ROS waiting lines) are freed for the purpose of future use. Reporting information on feed-through of the job is formed in this step.

The PPP ROS makes it possible to control the sequence of the execution of dependent jobs. For this purpose, an additional ROS job control language chart is formed which eliminates the necessity of intervention of the operator into the sequence of their excution. The identifier of the group of dependent jobs, the number of jobs which must be preperformed, and the condition under which the job must be activated are defined in it. Here, jobs from this group can be solved on various computers. A distinctive technological feature of the PPP ROS consists also in the fact that it is possible to transfer into ROS input waiting lines jobs started by the time sharing mode. Here, the time sharing mode functions in one of the computers and its users can obtain output sets of jobs performed on other computers of the system in which time sharing

programs are not run. Extensive technological capabilities are offered also by the console facility of the ROS, which makes it possible to form up to 96 classes of messages. This makes it possible to organize the following servicing zones for a multicomputer complex: control of a multicomputer computer complex; checking the course of the computing process; input/output of batch jobs; working with magnetic tape and disks; control of teleprocessing; checking the condition of hardware. Assignment of these zones helps to specialize the work of personnel operating the computer. Because of the facilities offered by the PPP ROS, the reliability of the operation of a multicomputer computer system is improved on account of the ability to repeat any stage in the processing of each job.

Experimental verification of the throughput of a multicomputer system under the control of "Automation of the Production Process of Information Processing at a VTsKP" programs as compared with the work of a number of local computers under the control of the YeS operating system, for "net throughput" (without taking into account the saving resulting from preprogramming of jobs and peripheral devices), has demonstrated that in processing information which can be categorized under the class of scientific and technical problems, the computer's capacity is increased by 10 percent, and of economic planning problems (e.g., of an EOI system), up to 40 percent. The maximum increase in throughput is achieved in solving problems with a high rate of input/output. The realizable capacity of a multicomputer computer system is increased also on account of the preprogramming of jobs and peripheral devices.

8831
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DEVELOPMENT PROSPECTS FOR COLLECTIVE-USE COMPUTER CENTER

Moscow VESTNIK STATISTIKI in Russian No 5, May 84 pp 44-50

[Article in "Mechanization of Statistical Reporting Work" section, by G. Kimask and V. Chiz, Estonian SSR TsSU [Central Statistical Administration]]

[Text] A collective-use computer center (VTsKP) was formed on the basis of the Republic Computer Center of the Estonian SSR TsSU at the end of the 10th Five-Year Plan period.

The republic's TsSU embarked on organization of the VTsKP while already having experience in serving enterprises and organizations of a number of sectors of the national economy. True, computing work was performed for customers in, as a rule, a non-integrated manner, but there was a certain amount of experience in serving various users.

In the course of designing and experimental operation of the VTsKP, the hardware base was re-equipped, a network was developed for data communication with user stations installed directly at the customer's site, and software was developed and introduced for controlling the remote processing of information, data bases, and processing of statistical information, as well as the information of enterprises and organizations of sectors of the national economy--the VTsKP's users.

YeS-1033 computers united into a multicomputer computer system operating under control of the "ROS-2" job entry subsystem, and YeS-1022 computers, constitute the foundation of the hardware base of the Estonian SSR TsSU VTsKP. The computers have an expanded set of peripheral devices. The main memory of each YeS-1033 computer has been increased to 1M byte. Teleprocessing facilities included MPD-1A and MPD-3 multiplexers, an MPD-1 multiplexer and 37 user stations (AP-1, AP-2, AP-4 and AP-64).

The data communication network for the city of Tallin is constructed on the basis of specially assigned and switched telephone channels. Intercomputer interchange of information between the Estonian SSR TsSU VTsKP and the republic's Gosplan Computer Center is made possible by means of a laser communications line which makes it possible to interchange data at higher speeds.

The user stations of the ESTEL-2 teleprocessing system, which are connected to the VTsKP by means of switched telephone channels, are installed at the data processing and computing centers and stations of the Estonian SSR TsSU and in cities and rayons. Switched channels of the switched telegraph system are also used for data communications.

The Estonian SSR TsSU VTsKP is connected to the USSR TsSU GVTs [Main Computer Center] and the RVTs [Republic Computer Center] of the Latvian SSR TsSU, by means of assigned telephone channels through which statistical information on the Estonian and Latvian SSR's is transferred.

Re-equipping of the center in connection with the formation of the VTsKP resulted in a substantial change in the composition of personnel. For example, the number of personnel operating computers was increased by 66 percent, and of programmers, by 61 percent. There was also an increase in the number of personnel making it possible to operate data communications equipment and user stations. The increase in the number of personnel of these categories took place basically on account of a reduction in the number of keyboard and punched-media computer operators. However, it must be emphasized that the total number of personnel at the center increased by only 3.4 percent as compared with 1977.

Formation of the VTsKP made it possible to expand considerably the amount of processing of statistical information on computers and to raise to a higher level the data processing and computing services for enterprises and organizations of the national economy.

Much attention is being paid at the VTsKP to work relating to development of the ASGS [Automated System of State Statistics]. The objective has been set of satisfying on a new technical and organization level the growing demand of the republic's control agencies for various kinds of statistical and economic information on progress in the fulfillment of State plans for economic and social development and of socialist obligations and on the efficiency of public production and scientific and technical progress, on the intelligent utilization of physical, labor and financial resources and available potential, on the increase in labor productivity, on the development of the agro-industrial complex, and on accomplishment of the food program, fulfillment of the social program and improvement of the well-being of the republic's workers.

As a result of supplying the VTsKP with modern computers and data communication facilities, the time required for working out a number of statistical problems has been shortened considerably and the analyticity of output information has increased. For example, in 1981-83 the time required for working out 11 statistical problems has been shortened, e.g., by four days for routine reporting on form No 1-p, by seven days for reporting on the state of livestock breeding on kolkhozes and at interfarm enterprises (form No 24), by eight days for reporting on form No 9-zag--purchases of cattle according to types and plumpness, and by 19 days for form No 1-tp--key indicators for the operation of industrial enterprises (entities) put into service or reconstructed, and by 14 days for reporting on the form for the consumption of electric power in industry.

New local electronic data processing systems have been developed and the analysis of statistical data based on the use of mathematical economic (simulation) models has been intensified. The processing of statistical data has been organized in interaction with data processing and computing centers and stations of the republic's TsSU in cities and rayons representing group stations for the gathering and primary processing of data.

The higher-capacity and more modern hardware base has made it possible to develop registers for national economic entities and to develop an automated data bank of statistical information. It is necessary to mention also the great opportunities for interaction between the republic's TsSU and Gosplan in the area of furnishing the latter with the required statistical data and of the obtainment of planning information by divisions of the Estonian SSR TsSU, as well as of the solution of the problems facing the TsSU and its computer system within the framework of the Republic Automated Control System (Estonian SSR RASU).

Let us mention some of the most important results of the work which has been done.

As part of the second phase of the ASGS, the first phase has been developed, in conjunction with the USSR TsSU Scientific Research Institute, and put into service, of the ISKHOD [Integrated Information Storage and Processing System] ASGS ABD [data bank] data bank, for five functional subsystems (statistics for industry, agriculture, capital construction, supply of materials and equipment and population budgets). The data base is updated annually. The register of national economic entities for the "Industry" and "Agriculture" subsystems has been transferred from the "Minsk-32" computer to a YeS [Unified Series] computer. Methods for economists to work with ABD information holdings are being optimized. Local electronic data processing systems have been developed for processing on a YeS computer statistical reports on form No 1-p (routine), with the production of summary reports for 10 outlines of the centralized plan and five bulletins for the republic's TsSU plan, and of reports on forms No 1-skh, 3-skh, 7-skh, 10-skh, 2-zag, 3-zag, 4-zag and 9-zag, and others, on purchases of agricultural products, as well as No 24, 24-skh, 2-mekh and 6-mekh.

The Estonian SSR TsSU has transferred to mechanized processing a number of big statistical jobs, part of them in cooperation with the USSR TsSU Scientific Research Institute. For example, materials have been fully developed by means of mechanization facilities for interindustrial production balance reports for the distribution of products by industries of the national economy (for the full and short programs). Analytical tables have been produced which characterize relationships between industries, as well as tables of total, direct and indirect cost factors. Based on data on the interindustrial balance, data have been processed on the computer on the production and distribution of products by ministry, as well as on commodity exchange (bringing in, sending out, exports and imports). Indicators of production efficiency have been developed in conjunction with the USSR TsSU Scientific Research Institute, based on registers of entities of the national economy, by employing mathematical economic models. Methods of calculating and analyzing these indicators are constantly

being improved. A total of 41 electronic data processing complexes, including 32 systems and 9 local, are being used for the purpose of performing statistical tasks, which constitute more than one quarter of the entire work volume at the VTsKP.

Authority for all-Union classifiers of technical and economic information has been entrusted to the VTsKP. Work is being done on overseeing and updating the all-Union classifier for enterprises and organizations, as the result of which it will be possible to obtain data by cities and rayons of the republic.

A territorial system has been developed for remote gathering of statistical information, based on AP-1 user stations (of the ESTEL-2 system) installed at data processing and computing centers and stations of the Estonian SSR TsSU. The software developed within the framework of the Statistical Information Teleprocessing System (STOSI) makes it possible to gather through switched telephone communications channels, via an AP-1, and to enter into a computer statistical operating information which is processed according to an appropriate program and is formated and output to a printer in the form of a summary bulletin. For the time being only statistical reports on the state of livestock breeding (form No 24-skh) are being processed in this manner. All routine statistical reports gathered through the republic's TsSU data processing and computing centers and stations will gradually be converted to this method of gathering and processing data.

An AP-64 user station connected to the center by means of an assigned telephone communications channel has been installed at the headquarters of the Estonian SSR Council of Ministers for the purpose of remote access to the economic and statistical information available at the VTsKP. Experience has demonstrated that remote access to data from the processing of routine (operating) reports is especially necessary for users of this user station. Therefore, the specialists at the VTsKP have developed a data teleprocessing information search system which makes it possible to form files of operating information from local systems, to access the necessary information from them, and to transfer it through a communications channel to the AP-64 displays installed in departments of the Estonian SSR Council of Ministers Affairs Administration. The data of reports on forms No 3-skh, 7-skh and 10-skh have been constantly transferred to this user as of 1982, and on form No 1-p (routine) since the beginning of 1984. Software is being completed for the possibility of remote access from an AP-64 to the data of other reports, in particular, on forms No 24-skh, 2-ks (routine) and 1-ks (routine).

The work program has been approved for organization of the combined functioning of two of the most important automated systems--the ASPR [Automated Control System for Planning Calculations] of the Estonian SSR Gosplan, and the Estonian SSR TsSU ASGS--according to which, at the first stage, to 1985, it is planned to enable the interaction of nine subsystems of the ASGS with individual subsystems of the ASPR. The following subsystems of the ASPR and ASGS are being integrated: combined national economic plan - national economic balance; standard of living - budget statistics; industry - industry statistics; capital construction - capital construction statistics; agriculture -

agriculture statistics; supply of materials and equipment - statistics on supply of materials and equipment; motor vehicle transportation and communications - statistics on transportation and communications; labor and personnel - labor and wage statistics; territorial planning - territorial statistics. The monthly transfer of magnetic information media on form No 1-p (routine) to the Estonian SSR Gosplan Computer Center has been organized, where after appropriate processing it will be used by the republic's Gosplan. In keeping with the comprehensive program for the development and entry into service of the first phase of the Estonian SSR RASU, the republic's TsSU VTsKP is taking part in development of the republic network of computer centers and an experimental zone for the republic data transmission network. The territorial system for remote gathering of information formed at the VTsKP is a component of the data communication network. Besides, this center is one of the base computer centers for working out interindustrial problems and problems of the automated information processing system of directive agencies.

The Estonian SSR TsSU VTsKP is taking part in the solution of ASGS problems at the Union level, too. STOSI software has been developed for use with the YeS operating system and has been put into experimental use at a number of computer centers of the USSR TsSU system. Work is under way on connecting other republic computer centers to them. A system for remote gathering of routine statistical reports through telegraph channels has also been developed. This system will be tested and introduced at the RSFSR TsSU RVTs and the USSR TsSU GVTs. Work has been completed on the development of the ISKHOD ASGS ABD for working with the YeS operating system, with respect to the formation and maintenance of data bank files and a module for forming tables with a random structure.

Procedural and organization problems are being solved anew at the VTsKP, relating to processing the information of users for whom the possibility has been shown of, without creating their own computer centers, solving ASU [automated control system] problems in an integrated manner by making extensive use of the teleprocessing mode. At the present time the Estonian SSR TsSU VTsKP has 50 users for whom 400 problems are being solved, more than 270 of which by using teleprocessing.

The VTsKP is doing work for the Estonian SSR Council of Ministers, the Tallinn gorispolkom of the Council of People's Deputies, the Estonian SSR Gosplan, 13 industrial enterprises and 34 enterprises and organizations in the nonindustrial sphere. Here principal attention is being paid to a comprehensive approach in solving the ASU problems of users, the introduction of new tasks and improvement of organization in processing them. For example, from 1976 through 1982, 56 tasks have been introduced for five ASU subsystems for the Tallinn Electrical Equipment Plant imeni M.I. Kalinin Production Association: control of technical preparation for production; control of technical and economic planning and supply of materials and equipment; operational management of basic production; and an ASU automated data bank. This ASU is designed on the basis of the SIOD [Integrated Data Processing System] data bank, whose information holdings increased during this period from 27M to 81M bytes. Practically the entire group of the plant's ASU problems are being solved at the present

time. Two sets of AP-84 equipment have been installed at the plant and initial data for entry into the computer are prepared at the site.

Development of the expanded teleprocessing network and the offering to users of direct access to computing resources have considerably increased efficiency in solving user problems. According to data from users, the saving from the use of VTsKP services (without taking into account the saving of equipment which would have been required for forming their own computer centers) equaled 308,000 rubles in 1982.

The great number and diversity of problems to be solved and the different intervals over which they are presented require special organization of the computing process at a VTsKP. The entire production process is divided into specific individual phases the execution of which is assigned to individual special services: for operational dispatching; preparation of hard data media; checking and output of information; operation of YeS-computer systems; remote reception-transmission of information and operation of user stations; completion and management of the data bank; production process and introduction of user tasks; servicing of YeS-computer systems; servicing of teleprocessing equipment; and development of the VTsKP.

Essentially, organization of production at the VTsKP consists in the fact that all control of the production process and of interaction of departments in solving specific problems is accomplished on the basis of appropriate documentation. The existence of standard production process routes makes it possible to plan any information processing process and to determine in advance the possible alternative production routes in case any non-standard situations (errors, failures, malfunctions, etc.) arise. Here, in any possible mode--interactive, request, local or remote batch--each task to be executed is divided into independent job units already during the period of experimental utilization. By a job is here meant the sum of sequential operations united into a specific production process route. This is essentially the stage of execution of the task, the results of which must be checked after processing on the computer before beginning to perform the next job. At the stage of introduction of a task, production process documentation is formed for each job, including a production chart defining the required standard route with respect to production subdivisions. It also contains data regarding input and output information and the numbers of instruction charts used in performing a specific job; instruction charts for each subdivision taking part in the performance of this job; and a number of other documents (flowcharts, etc.) making it possible to determine the interrelationships between the user and individual executing subdivisions.

In the formation of production documentation, a specially developed codifier is used for users, ASU subsystems, tasks and jobs. The operating dispatching department, on the basis of a production process chart, draws up an accompanying route list in which the execution of each step of the job is recorded.

Operational calendar planning of production is performed in two steps: Schedules are developed for the solution of user problems for the year, as an appendix

to contracts, and by month. The solution of problems is planned on the basis of a list of jobs and the amounts of information to be processed in subdivisions, in accordance with the technical documentation, a set of which is formed for each task in the production process and introduction department. Deadlines for the completion of jobs are indicated on schedules with precision of minutes. Schedule deadlines which have been violated for any reason are corrected on the accompanying route sheets. For the purpose of facilitating the labor-intensive process of drawing up schedules for solving problems, the center's specialists have developed and are using the "Automation of Control of the VTsKP Production Process" software.

During the period of the development and formation of the VTsKP, its hardware base has been re-equipped. The obsolete equipment, in particular, punched-media computers, "Minsk-32" computers, "Minsk-22" computers, etc., has been replaced as steady growth in the amount of work to be performed has occurred.

Formation of the hardware base of the first phase of the VTsKP had its own particular features. The contractor-detail design stipulated that the computer center be furnished with equipment produced by CEMA member countries. It was necessary for practically the first time in the country to test under conditions of actual integrated use the serviceability and actual interfacing of a multicomputer system and all teleprocessing equipment supplied by enterprises and organizations of the national economy, which made it possible to avoid errors in furnishing newly created computer centers with equipment and to choose the optimal composition of equipment.

During the course of experimental and industrial operation, the VTsKP provided for the fulfillment and overfulfillment of plan quotas for all economic indicators, an increase in work volume in wholesale value, a growth in labor productivity, and a reduction in production costs.

Data on Fulfillment of Key Economic Indicators for Estonian SSR TsSU VTsKP for 1977-1983

Indicator	1977	1978	1979	1980	1981	1982	1983
Work volume in wholesale value, thousand rubles	1572	1976	2615	3125	3124	2798*	2738
Mean output per worker, rubles	2817	3172	3784	4549	4698	4456	4923
Cost per ruble of volume of work performed, rubles	1.07	1.02	0.93	0.90	0.88	0.98	0.91
Profit, loss (-), thousand rubles	-110.3	-56.1	187.2	324.3	305.4	0.2	248

*The reduction in volume of work as compared with the previous year, as well as the corresponding changes in other indicators, were caused by the introduction

as of 1 January 1982 of new reduced rates for the services of computer centers (the volume of work in wholesale value for 1982 according to the rates in effect before 1 January 1982 equals 3.288 million rubles).

In 1983 at the VTsKP, the mean output per worker as compared with 1982 increased by 10.5 percent, the cost per ruble of the amount of work performed was reduced by 7.1 percent, and profit increased by 248,000 rubles. The entire growth in labor productivity was achieved on account of an increase in the level of utilization of YeS computers and expansion of the user station network. The mean 24-hour utilization of YeS computers exceeded the norm and equaled 17.3 h (net time) in 1983. The multiprogram mode is being used extensively. The percentage of the amount of work done in this mode is 33 percent. The introduction of the multiprogram mode made it possible to lower by 8.0 percent on average the cost of the processing of information for users. The percentage of the amount of work in the teleprocessing mode reached 43 percent. Here a considerable amount of work on gathering and processing data is done directly at user stations.

The experience of three years of operation made it possible to define ways for further development of the Estonian SSR TsSU VTsKP. It was shown to be necessary to increase the capacity of the central computer system by including larger-capacity computers--not below a YeS-1045--by mastering to the full extent the operation of multicomputer systems under control of the "ROS" [distributed operating system] subsystem, and by completing work on automation of the production process. This will make it possible to increase the amount of VTsKP services, to provide higher efficiency in the functioning of users' ASU's and in the solution of ASGS problems based on automated data banks, and will make it possible to expand the user network and to improve substantially the operating characteristics for teleprocessing of information. These problems are being solved in the current five-year plan period in keeping with plans for the development of the second phase of the VTsKP.

It is also necessary to provide for the extensive introduction of automated data banks both for users of the national economy and for solving ASGS problems. It is necessary to improve work on the development of EOI systems. It is necessary to obtain from the information entered into a computer all the sections and data required by local management agencies (for the Estonian SSR, in the necessary cases, with respect to rayons and cities), and by departments of the Estonian SSR TsSU, as well as to have the ability to automatically enter data into the ISKHOD ABD directly from the magnetic media of existing systems.

An important problem requiring an urgent solution is the development and introduction of a teleprocessing system unique for the VTsKP and making possible all necessary operating modes with sufficient efficiency. The most promising in this regard is the STOSI, which is already now capable of enabling the operation of all types of user stations and efficient intercomputer interchange of information. It will be possible to solve VTsKP problems by means of this system after some modifications with respect to interaction with application programs.

Further development of the user network requires the installation of minicomputers at a number of user sites for the purpose of processing operating information. The distribution of work between the VTsKP's YeS computers and the mini-(micro-)computers installed at user sites and functioning in conjunction with them will make it possible to make considerably less expensive and to improve the efficiency of the processing of information and to improve the quality and increase the amount of services offered to users.

Formation of the republic Estmashinform Association based on the VTsKP should raise to a higher technical and organization level the operation of the entire computer system of the republic's TsSU. In particular, it is necessary, in our opinion, to develop group collective-use computer centers by uniting small data processing and computing stations.

8831
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ASPECTS OF TECHNOLOGICAL PROGRESS OF THE USER INFORMATION SERVICE OF THE REPUBLIC AUTOMATED SYSTEM OF SCIENTIFIC TECHNICAL INFORMATION

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA (NAUCHNO-PROIZVODSTVENNYY SBORNIK) in Russian No 2, Apr-Jun 84 (manuscript received 12 Dec 83) pp 38-41

[Article by V. P. Tsymbal, graduate of engineering and A. A. Babich, engineer]

[Text] The information organizations comprising the Republic Automated Science and Technical Information System (RASNTI) of the Ukrainian SSR are unified into a network with a hierarchical tree structure. The economic effect from network interaction is obtained through the execution of the most intensive operations at a single network node. The numerous network nodes freed from these operations are distributed in the network in such manner that the lower and more saturated a node is, the fewer the number of intensive operations it is given to execute, so that the number of operations decreases from level to level according to how far the hierarchical ladder is descended. The conversion and automatic indexing operations, which occupy from 50 to 80 per cent of the machine time required for processing the magnetic tapes arriving from central data banks are accomplished at a single information organization: the UkrNIINTI [Ukranian Research Institute for Scientific Technical Information]; search procedures are processed at six TsNTI's [Scientific Technical Information Centers].

The functions of the Head Republic automated data center [GRAITs], an information organization which carries the basic load of input data flow processing, are at the present time carried out by subdivisions of the UkrNIINTI.

The diversity of fields of the Republic's information needs pose before the RASNTI the problem of absorbing the flow of scientific technical information (including from foreign sources) independent of a document's form and content. And the principle of keeping the software for handling the text independent from the subject matter of the information files must

be observed. The documental, and not factographic nature of the RASNTI does not allow the creation of special data retrieval languages, thesaureses, and keyword dictionaries, but enables natural language to be utilized, implementing automatic indexing for text compression and for the elimination of non-informative words. Automatic indexing entails the ioslation of keywords, verifying that they are not included in a stopword dictionary, and compression to six symbols. Tapes with converted formats and indexed scientific technical information document texts are sent to the central automated data centers (AITs).

The central automated data centers are comprised of intersectorial territorial TsNTI's, which possess more complete (relative to the Republic SIF [expansion unknown]) resources on ordinary microfiche, and printing equipment for duplication. The order in which the Republic oblasts are assigned to the base AITs is selected in order to assure homogeneity of requested information and uniformity of the AITs load. The regional TsNTI's of the Republic, which are assigned to the base AITs and located at a lower system hierarchy level carry out the compilation of a formalized description of the requested information for their regions in terms of requests in the automated system of scientific technical information [ASNTI] format, bulletins to the users and collecting requests for coding of sources.

A library of standard queries has been created for improving the data service system (SIO) technology, and for minimizing user query processing costs.

At the UkrNIINTI alone, 7500 queries were processed in 1983. The number of queries received at the ASNTI, including MKI [expansion unknown] indexes for patent information retrieval, exceeded the designed capacity of the system (5000 non-intersecting search formulations). This was calculated based on the machine time alloted for data retrieval operations, taking into account the necessity of complete processing of the input data flow, the search, and the duplication of the data files on magnetic tape for all nodes of the RASNTI. Consequently, the AITs located at the lower levels of the hierarchy, which have been freed from the nessity to convert and index the input documents, may process a much larger number of queries than established by standard norms.

Given the existing system facilities, the average pre-machine processing time of a single query comprises 73 minutes. The average time required for the input, control and indexing of 10 queries is 15 minutes. Consequently, the average time expended for the compilation, editing and input of a single query comprises 77 minutes, where the cost of these operations averaged over a one year period comprises 5 rubles (including wages for personnel doing the processing, overhead, insurance costs and expenditures associated with inputing the query into the computer and doing two proof readings, etc.). The centralized formation of a standard query library and its decentralized utilization in all nodes (AITs's) of the USSR RASNTI is the primary means of minimizing the cost of query compilation at this step.

A group of consultants has been created at the GRAITs for the creation of a standard query library. Queries selected for the library must possess a response relevancy of 80 per cent over the course of one year.

Queries arriving at the GRAITs from all the network AITs's in the form of magnetic tape files and filled-out forms in pre-machine formats for the corresponding queries are carefully examined. Their texts are edited and indexed. Then a file merging procedure is executed, forming a single distribution file of the latest version of the standard query library. Each query in this file possesses a reserved number, which must not coincide with the numbers of the queries compiled by the user. Some fields of the forms for pre-machine formats are not filled out (user requisites, current year). The distribution magnetic tape which contains the standard library file is reproduced according to the number of AITs's in the network and sent to all nodes of the RASNTI. This magnetic tape is accompanied by the texts of the queries written in the blanks of the pre-machine inquiry format and a prospectus containing the natural language query texts, which are grouped according to a particular subject definition (such as the GASNTI index). The described standard library is valid for one year.

The user, upon concluding a contract for information service from the ASNTI, defines his specific information need using the standard query list. When there is no standard query that meets the need of the user, individual queries must be prepared, which can supplement the standard query library for the next year.

The designated standard queries are called up in machine language according to a special program, and are automatically entered in the user requisite service fields. The obtained file is merged with an individual query file by the standard procedure, forming a complete query file in the given network AITs, ready for industrial utilization through IRI [expansion unknown] retrieval.

The ASNTI software is utilized at the primary TsNTI's in network operation, where independent query files are created. The TsNTI's in network operation, where independent query files are created. The TsNTI's joined to them also declare their information requirements in the form of queries directed to the branch TsNTI, i.e., with the given technology standard, the query library can be used by organizations and enterprises that have implemented the ASNTI and by the republic's TsNTI's.

The estimated yearly savings comprise 62,500 rubles for a one thousand query library and a turn-over factor of 0.5 for the standard query resource stock. The savings comprise around 0.5 million rubles per year if the resource turn-over and the number of duplications made of a given query are increased.

The utilization of the described query file organization procedure in the network nodes permits a distributed query bank to be created, from which intersecting subject query sets can be identified by one or another logical criteria, for the data support of various computerized management

systems, integrated goal programs, the Food Program, etc. Duplication of standard query servicing is eliminated through the existence of a distributed query bank. Patent data in the form of MKI indexes should be included in the standard query library, in addition to subject queries.

The creation of a single, centralized standard query library and its recurrent utilization in the network nodes can significantly enlarge the number of serviced queries and RASNTI users without augmenting AITs service staff. The standard query libarary's efficiency will increase as new optimal control methods are implemented in the RASNTI of the Ukrainian Republic.

12678
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COST-EFFECTIVENESS OF COMPUTERS IN BELORUSSIAN LIGHT INDUSTRY DISCUSSED

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 11, Nov 83 pp 20-23

[Article by E. Bolyanskiy, director of the Republic Sector Computer Center, candidate of economic sciences, under the rubric "Science and Practice of Management": "Are Computers Cost-Effective?"]

> [Text] In BSSR light industry, a sector management information system (OASU) [MIS] and 31 enterprise and industrial association MIS's are in operation, covering almost half of the enterprises. The enterprises with MIS's account for more than 75 percent of total production. Computers in the centers handle various planning, accounting and analysis tasks.

There is no doubt that the introduction of MIS's has enabled raising efficiency and the quality of calculations, improving information support to managers at all levels, reducing labor costs for processing the continually increasing amounts of information and eliminating duplication of calculations for the same indicators. As a result, management has been given a more extensive capability for analyzing enterprise economic production activity and more substantially justifying measures aimed at raising industrial efficiency.

Under modern conditions, finding the share of the economic effect from introducing an MIS is essentially very difficult since deriving an economic effect in an enterprise involves the effect of many interrelated factors, the influence on the final result of which can be established only very conditionally. Therefore, along with using the existing procedure for determining MIS effectiveness in the BSSR Ministry of Light Industry system, studies of the individual factors in this effectiveness have been made.

As a result, for example, it was found that production growth for enterprises equipped with MIS's averages a third higher than for those without MIS's. With that, the average number of industrial production personnel in the first group of enterprises is increasing several-fold less than production volume, and its increment is less than that in the second group of enterprises.

At the same time, the number of engineers, technicians and employees in the first group of enterprises has increased an average of 30 percent, but only 16 percent in the second group. This is because the number of administrative and managerial personnel is increased when additional specialized subdivisions (computer centers or MIS departments) are set up in the enterprise management

structure. Over time, the increase in the number of engineers, technicians and employees is appreciably reduced while production increases substantially.

A comparative analysis of the labor intensiveness of processing economic information has shown that it declined 37.5 percent under MIS conditions. Some computations now performed would simply be impossible to do without computers. If all work now performed would be done the traditional manual way, labor costs would be a minimum of three- to four-fold higher than those under the current conditions of employing computers.

As a result of analyzing the cost of information processing, it was found that it has increased 1.7-fold under the conditions of operating MIS's. This is due to the high cost of computer hardware, and thus the cost of machine time.

Some shortcomings were also found in the functional MIS structure. Thus, for example, 94 tasks are handled in the MIS in the Orsha Order of Lenin Flax Combine, 78 in the MIS in the Baranovichi Industrial Cotton Association, and 15 tasks each in the MIS in the Grodno Thin Cloth Combine and Bobruysk Clothing Factory imeni Dzerzhinskiy. The number of subsystems in the enterprise MIS's varies from 6 to 10. In some MIS subsystems, there are only 2 or 3 tasks each; this indicates low coverage of management functions by automation and lack of coordination among the tasks handled.

The percentage of highly efficient optimization tasks was found to be low (only five percent) while statistical accounting tasks make up almost a third of all tasks. Tasks to provide appropriate information to enterprise management are almost double those intended for use at lower levels. Universal tasks (for use at all management levels) make up only 18.9 percent of the total. By frequency, the highest percentage is for tasks for monthly reports (37.9 percent). The percentage of tasks handled on line is 31. To increase information support on economic production activity to management at all levels, the number of such tasks and new highly efficient tasks for optimizing production plans and individual manufacturing processes should be increased.

Study results indicated that along with the positive effect on enterprise economic production activity, MIS development leads to an increase in the number of administrative personnel and an increase in the cost of information processing, that the functional set of tasks requires improvement and development of MIS, and this causes the need for intensifying efforts on raising the efficiency of using computers in managing industrial associations and enterprises.

MIS efficiency, in our view, can be raised by improving organization of design efforts, i.e. eliminating duplication of them, introducing new efficient tasks, i.e. giving priority to automating management functions which can have the most positive effect on enterprise activity results at a given stage, and by reducing costs for computer operation by using more progressive organizational forms, setting up multiuser computer centers and intensifying computer utilization. These are precisely the directions which have become the basis for the effort underway in the BSSR Ministry of Light Industry to raise MIS efficiency for production associations and enterprises.

Since a third of the enterprise MIS's need to be translated for Unified System hardware and the majority of other systems need improvement and development, which would require high costs for design since an individual MIS design would have to be developed for each enterprise, a new approach was taken in the BSSR Ministry of Light Industry to solve this problem. In this case, the decision was made to cease development of individual MIS's for similar enterprises and to focus efforts on developing standard MIS's for the textile, tricot, clothing and leather shoe subsectors.

Standard MIS design is being implemented on the basis of typification, unification and standardization of MIS elements, subsystems and functional management tasks for homogeneous enterprises in each subsector. With that, plans call for widespread introduction in the remaining enterprises of design solutions worked out in the base facilities during their development and introduction. This direction has become the main one in the setting up and developing enterprise MIS's in the current five-year plan.

Despite the fact that enterprises such as the Minsk Order of Lenin Worsted Combine imeni the 50th Anniversary of the Belorussian Communist Party, the Pinsk Industrial Textile-Tricot Association imeni the 60th Anniversary of Great October, the Minsk Industrial Clothing Association imeni Krupskaya and the Minsk Luch Industrial Shoe Association, which have adequate experience in organizing efforts on management automation, were selected as the base facilities for developing standard MIS's, the customers for the standard MIS's are not these enterprises, but the corresponding industrial administrations in the ministry.

This approach stems from a number of reasons. First, the director of efforts on developing standard MIS's must have sufficient authority and competence to deal with the problems that occur during system design and introduction. Second, it is desirable that the director be at a level higher than the enterprises since he has to make decisions, the execution of which is mandatory for the given enterprises. Third, regulating documentation circulating in enterprises and unification of primary documents based on prevailing sector procedures for planning, accounting and analysis of production are inevitable in developing standard MIS's. Therefore, the chiefs of industrial administrations in the ministry were designated as the directors of the efforts on developing standard MIS's for the appropriate subsectors.

The "Regulation on Organizing Direction of Efforts on Introducing Computer Technology and MIS's" was drafted. Efficient organization of these efforts with respect to current requirements imposed on them, rights and responsibilities of officials in designing and introducing MIS's for all purposes, and the inclusion of leading specialists from the ministry staff and the Republic Sector Computer Center in working groups are provided for in the regulation. All these measures should facilitate raising the soundness of decisions made and prevent a subjective approach in MIS development.

The sector has standards for labor costs for various types of design efforts. This allowed reducing costs per task development an average of 1,800 rubles in the ROVTs [Republic Sector Computer Center]. The new procedure for developing standard MIS's suited for introduction in many similar enterprises in the same

subsector considerably reduces costs for performance of design efforts and ensures a higher scientific and technical level of the systems since they are designed with regard to making use of data banks and other current requirements.

New efficient optimization tasks are being applied more and more in management practice. Thus, the task "Calculation of the Optimal Plan for Cutting Tricot Fabrics" operates in the subsystem "Management of Technical Preparation of Production." In the Vitebsk Order of Lenin Tricot Hosiery Factory imeni the KIM [Communist Youth International], this task allows saving up to 1.5 percent of the fabric processed. The annual effect is about 90,000 rubles. Similar tasks were incorporated in the MIS for the Gomel March 8th Tricot Hosiery Factory and the same tasks for cutting cloth operate in the MIS for the Minsk Komsomolka Industrial Clothing Association and Vitebsk Znamya Industrializatsii Clothing Factory.

The task "Calculation of the Optimal Composition of Mixture of Fibers" introduced in the Baranovichi Industrial Cotton Association allowed obtaining an economic effect of 191,700 rubles. The task "Calculation of the Optimal Production Plan," introduced in the "Technical and Economic Planning" subsystem in the Orsha Order of Lenin Flax Combine, yielded annual savings of 242,700 rubles. Successfully operating in the Gomel March 8th Tricot Hosiery Factory is the task "Optimal Plan for Loading Knitting Equipment," and in the Baranovichi Industrial Clothing Association, the task "Optimization of the Scheme for Division of Labor." A substantial economic effect has also been achieved here. Optimization tasks are now being introduced in many sector enterprises. The number of them has increased from 6 in 1975 to 59 at present. In 1985, at least 102 tasks on optimization of both individual manufacturing processes and production plans will be functioning; this will undoubtedly allow a considerable increase in MIS efficiency in sector enterprises.

Along with optimization, tasks such as "Calculation of Personal Production Plans of Pieceworkers and Accounting for Their Fulfillment," for example, are being developed and introduced in enterprise MIS's. The introduction of this task at the Vitebsk Znamya Industrializatsii Clothing Factory and the Minsk Clothing Industry Association imeni Krupskaya has allowed calculating worker production plans for the five-year period, year, quarter and month and ensuring mutual coordination of them just as of the production plans for the worker, brigade, shop and enterprise as a whole.

The composition of tasks such as "Calculation of the Product Delivery Plan" and "Efficient Accounting of Fulfillment of the Product Shipment Plan" has now been expanded in the majority of enterprises. This is facilitating a substantial increase in the level of fulfillment of contract obligations with product consumers. Thus, while sales with regard to meeting delivery according to contractual obligations were underfulfilled an average of 1.7 percent in 1979, this amounted to only about 0.4 percent in 1982.

Multiuse of computers is widely practiced. Information processing is handled by 20 computers in 7 multiuser computer centers. They service 27 MIS's. Information for almost 80 percent of the tasks handled in all MIS's is processed in the multiuser computer centers. With organization of the multiuser

computer centers, capital costs for developing enterprise MIS's and operating expenses for computer maintenance and computer center personnel pay declined substantially. Also, collective use of computers has facilitated more uniform and higher loading of the hardware.

In the multiuser computer centers, the computer load has been higher than prescribed by plan since they were placed into operation, and in several, reaches more than 16 hours per day with a three-shift operation. In 1982, the average cost per machine-hour was 49 rubles 84 kopecks on a Unified System and 28 rubles 40 kopecks on a Minsk-32 computer in a multiuser computer center which is 8-12 percent lower than in a single-user computer center.

The collective form of using computers will be implemented more extensively in future. In particular, plans call for closing the single-user center in the Minsk Luch Shoe Industrial Association. This enterprise will become the eighth subscriber to the ROVTs [republic sector computer center] which now handles the ministry MIS and six MIS's for Minsk light industry enterprises.

However, as experience has shown, setting up a multiuser computer center is efficient only within the limits of a city. This is due to the high cost of sending large amounts of information over communication lines. Sending current information great distances by courier is inefficient.

A major reserve for raising level of computer operation is enabling operation of them in the multiprogram mode. As is known, modern computers allow using several central processing devices simultaneously by overlapping operation of the central processor and I/O devices. This also enables raising computer throughput and productivity and allows substantially reducing information processing costs. Also, in a number of cases, intensifying computer utilization facilitates reducing the shortage of computer capacity.

The average multiprogramming factor is 2.3 in the BSSR Ministry of Light Industry Republic Sector Computer Center on the YeS 1035 computer in the multiprogramming with variable number of tasks [MVT] mode. The task "Automated Accounting of Machine Time on Unified System Computers" facilitated achieving this result to a considerable extent. It allows obtaining data both for tracking the time used by each user and for accounts with them for rented time with regard to computer operation in the multiprogramming mode.

The effectiveness of the measures being taken to improve the technology of computer operations and intensify use of computer hardware is indicated by the average cost per task operation declining 674 rubles compared to 1978 at the Republic Sector Computer Center. There is no doubt that measures being implemented will promote a further increase in computer and MIS effectiveness.

8545
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USE OF ROBOTS AND MICROPROCESSORS IN CHEMISTRY

Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 1, Jan 84 pp 40-42

[Article by Karl Hansel, CEMA Secretariat]

[Text] The main scientific and technical problems subject to joint development using the most effective forms of cooperation of CEMA countries also include the use of computer technology. Interaction in solution of this problem makes a significant contribution to an increase of the scientific and technical level and efficiency of production and also of labor productivity.

A great deal of attention is being devoted to problems of the use of computer technology in the sector in the framework of the Permanent CEMA Committee on Cooperation in the Field of the Chemical Industry (further referred to as the Committee). Automated control systems, for example, high-pressure polyethylene production systems and suspension polyvinylchloride, research complexes, program systems for complex calculations, specifically, static and dynamic modes of flowcharts of the production structure, single- and multiphase chemical processes under steady and transient conditions were developed as a result of joint work and the skills of the specialists of the participating countries were also increased.

The Committee determined the priority directions of multilateral cooperation after signing general agreements on cooperation in development and extensive use of microprocessor technology and robot engineering during the 36th meeting of the CEMA session:

the use of microprocessor and computer technology for industrial efficiency and automation of research, design and control of production processes and management of enterprises;

the use of robots and manipulators, primarily for mechanization and automation of transport-warehouse and loading-unloading operations;

the use of mathematical modelling and optimization methods in development of modern production and planning decisions that provide efficient and economic consumption of fuel-energy and raw material resources.

Several agreements on multilateral scientific and technical cooperation of interested CEMA countries in selected problems of production preparation and management have been signed and are being prepared for signing according to this.

Thus, solution of a number of problems of automation of scientific research using microprocessor and computer technology was provided by the agreement on development and creation of an automated scientific chemical production research system, the draft of which is ready for signing. This agreement should combine the efforts of more than 15 organizations in the Peoples Republic of Bulgaria, the Hungarian Peoples Republic, the USSR and CSSR on development of a modular hardware system for research benches. It includes microreactors of different designation, gas and liquid flow proportioning devices at the level of micro flow rates, sampling devices, thermostats, service devices for acceleration of adjusting work and devices for integration with microprocessor technology and microcomputers. Moreover, the development of program packages for control computers and universal computers, oriented toward solution of experiment planning tasks and simulation of chemical production processes, equipment and systems, is planned. This will create prerequisites for a sharp increase of the labor productivity of investigators and a signficant reduction of the deadlines for obtaining input data for design of chemical production processes and control systems.

The agreement on scientific and technical cooperation on the problem "Development of a unified computer-aided design system" was signed in 1981 by the managers of the corresponding ministries fo the Peoples Republic of Bulgaria, the Hungarian Peoples Republic, GDR, the Polish Peoples Republic, the Socialist Republic of Rumania, the USSR and CSSR. The most important planning organizations of these countries are participating in implementation of the agreement under the supervision of a council of leading specialists. The State Scientific Research and Planning Institute of the Nitrogen Industry and Organic Synthesis Products (USSR) is fulfilling the functions of coordinator.

The agreement provides for development of program systems for computer calculation, information funds and methodical instructions for basic calculations and operations in design of chemical plants using computer technology and the developed peripheral equipment system, including displays, graph plotters and so on, on the basis of clear sharing of labor among the participating organizations. The joint activity is directed toward creation of prerequisites to reduce the deadline for development and to increase the quality of the planning decisions. The technical assignments and drafts of a number of program packages have been prepared. In 1982 the planning organization of the CSSR completed a detail plan of a control program for hardware-production calculations, which is already being used at the Leipzig-Grimma Chemical Machine Building Combine (GDR). The use of it is intended by planning organizations of the Peoples Republic of Bulgaria and the USSR. A broad exchange of programs for calculation of the physicochemical properties of matter, chemical production equipment and pipeline systems between the cooperating organizations has been organized. Regular publication of annotations of computer programs, developed by the planning organizations and scientific research institutes of CEMA countries, in the Information Bulletin on the Chemical Industry and in the Inforkhim system, also contributes to this exchange.

To accelerate fulfillment of the agreement, the Committee recommended at the 61st meeting (March 1983) that the participating countries consider the possibility of more extensive introduction of YeS hardware in planning organizations (including alphanumeric and graphic displays and graph plotters) and also mini- and microcomputers.

The use of microprocessor technology in production control systems is provided by a single agreement and by the drafts of two agreements. The agreement on development of pilot prototypes of an automated paper production control system was signed in 1983 by the enterprises and organizations of the GDR, USSR and CSSR. To increase the productivity of papermaking machines, to improve product quality and to reduce the expenditures of fiber and steam per unit product, they turned to solution of the following tasks: development of two pilot prototypes of an automated paper production control system based on the coordinated concept, development of typical programs for the control system and mutual exchange of measurement hardware.

The draft of the second concerns integrated automation of fermentation processesin production of antiobiotics. More than 20 institutes and enterprises of five CEMA countries and SFRYu [the Socialist Federated Republic of Yugoslavia] expressed an interest in cooperation on this problem. The draft provides for development of specific production production monitoring devices, local automation systems and also mathematical modelling and optimization of production processes, development of control systems based on microprocessor and computer technology and automation of scientific research.

The third agreement was prepared on the problem "Development of basic software-hardware complexes of distributed chemical-technological production systems by coordinated needs," included in the work program according to the General agreement on cooperation in development and extensive use of microprocessor technology in the national economy of CEMA countries. Four organizations from the Peoples Republic of Bulgaria, the Hungarian Peoples Republic, the Polish Peoples Republic and the USSR are participating in this work. It is directed toward development of standardized firmware based on microprocessor technology with the necessary design, methodical and operational documentation for design of automated production process management systems in the chemical and petrochemical industry.

The Agreement on scientific and technical cooperation on the problem "Development and improvement of the automated online control system (ASOU) of petroleum refining and petrochemical complexes," which provides cooperation of five petroleum refining and petrochemical combines and research organizations from the Peoples Republic of Bulgaria, Hungarian Peoples Republic, Polish Peoples Republic, the USSR and CSSR, is in the coordination stage. Its goal is to develop a program system for partial automation of preparation of decisions on production management during time intervals from a month to 24 hours using economic-mathematical methods and modern microprocessor and computer equipment. Improvement and supplementation of existing program packages for dividing the monthly plan into intramonthly intervals, for accounting and monitoring of the course of production and also the use of more improved mathematical models for solving the problem of coordination of the working

conditions of mixed production units have been planned. Coordination of the joint activity of the organizations of the USSR Minneftekhimprom [USSR Ministry of Chemical and Petroleum Machine Building] should provide close coordination with work within the framework of the Intergovernmental Committee on Cooperation of Socialist Countries in the Field of Computer Technology.

An agreement on scientific and technical cooperation on the problem "Compilation of models of the balances of intersector and interproduct ties in the chemical industry using computers for planning" was signed in 1983. The joint work, in which five organizations from the Peoples Republic of Bulgaria, the USSR and CSSR are participating, is directed toward increasing the efficiency of preparation and decision-making processes in production planning, material and technical resources, capital investments and introduction of production capacities using models of balances of intersector and interproduct ties and a number of optimization criteria.

The Committee considered the status of work on preparation of agreements and determined the deadlines of their completion and signing at the 61st meeting. Moreover, it commissioned its organizations to develop new proposals on coordinated topics of multilateral cooperation, specifically in the use of robots and manipulators, and presentation of them for consideration of them at the 64th meeting. These proposals are the main ones in the given area for organization of multilateral cooperation of interested CEMA countries in 1986-1990.

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PROBLEMS OF DEVELOPING, INTRODUCING AUTOMATED SYSTEM FOR MAINTAINING PRIMARY TRUNK LINE AND SECONDARY NETWORKS FOR COMMUNICATION IN THE COUNTRY

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA (NAUCHNO-PROIZVODSTVENNYY SBORNIK) in Russian No 1, Jan-Mar 84 p 61

[Article by V. G. Bondarenko, candidate of engineering sciences, and V. G. Kryachek, engineer, in the section entitled "In the NTO [Scientific and Technical Society] Organizations"]

[Text] The republic scientific and technical conference on "Problems of Developing and Introducing the Automated System for Maintaining the Primary Trunk Line and Secondary Networks for Communication in the Country" was held in Rovno in October 1983. The conference was organized by the Ukrainian Republic Board of the NTO RES [Scientific and Technical Society of Radio Engineering and Telecommunications] imeni A. S. Popov, the UkSSR Ministry of Communications, and the Kiev Branch of the Central Scientific Research Institute of Communications [KONIIS].

More than 100 representatives from the UkSSR Ministry of Communications, scientific research and academic institutes, maintenance enterprises in the union trunk line network (TTsUMS [Central Administration of Trunk Line Communications]) and industrial engineering administrations for communications, long distance telephone stations and other organizations in the Ministry of Communications took part in the conference.

The conference was divided into these sections: "Long Distance Communications," "Data Communications," "Telegraph Communication and Electronic Switching" and "Line and Cable Structures."

More than 90 papers were read in the plenary and section sessions.

A. M. Stetsenko, in his paper, "Experience of the Effort on Developing and Improving the Operation of the Primary Communication Network of the UkSSR Ministry of Communications and Raising Its Quality," analyzed the effort by UkSSR Ministry of Communications enterprises on maintaining exchange and line structures in the primary network. It was shown that introduction of progressive methods for servicing communication lines is one way of improving monitoring of the preservation of cable lines and raising the technical condition and reliability of communications.

In his paper, "Basic Principles of the Automated System for Efficient Maintenance (ASOTO) of the Primary Trunk Line Network (SMP) for Communications," V. G. Bondarenko formulated the basic tasks and functions of the automated system developed at the Kiev Branch of the Central Scientific Research Institute of Communications.

The paper by R. G. Zontakh and Ye. N. Sazonov, "The Network Node as an Object of Automation of Efficient Maintenance and Management" dealt with the topical theme of establishing an ASOTO maintenance section and ASOTU executive information station (STO-IP) at the network node. The authors defined the requirements for the STO-IP and its functions and tasks.

In his paper, "The Communication Line as an Object of Automation of Maintenance," B. P. Borisov discussed the problems of checking and diagnosing the status of a communication line.

The paper by V. K. Goremykin and S. M. Pauk, "Features of Using Micro and Minicomputers in Systems for Information Support of Maintenance Processes," dealt with information support systems (SIO) development. The functions of an SIO, a component of a distributed automated system, were defined.

In the "Long Distance Communications" section, papers by R. G. Zontakh and V. T. Fomkin covered the relevant issues in organizing STO and IP [maintenance and information sections]. It was shown that in the network node, the object of efficient management and object of maintenance are one and thus it is advisable to use common hardware and personnel. The basic tasks and functions of the STO-IP [maintenance and information sections] were defined.

The papers by A. F. Bogomolov, V. L. Sidnin, A. A. Bychkov and M. P. Perel'man covered the problems of optimizing algorithms for restoring communications during facilities maintenance, developing a model for automating the maintenance process, and processing primary signals.

In the papers by G. P. Chernyy and N. V. Kiyanits, the problems of acquiring primary signals, sending them to the STO [maintenance section], representing them on a display, documenting and sending them to upper levels in the hierarchy were discussed.

In the "Data Communications" section, papers on the problem of PD [data communication] in digital communication systems, which are being introduced widely in rural communications, were discussed. It was reported that recommendations for improving the basic qualitative features of the PD-200 network were drafted in the Kiev Branch of the Central Scientific Research Institute of Communications.

A number of papers covered development and introduction of multifunctional measuring instruments based on microprocessors.

In the "Telegraph Communication and Electronic Switching" section, papers covering development and introduction of electronic telegraph apparatus into the industry for terminal stations, which reduces manual labor costs in communication departments, were presented.

Considerable interest was shown in the paper by V. I. Golosnyy on using facsimile terminal equipment for telegram data communications, designed on the principles of statistical processing and coding of the signal with a high degree of compression of its volume.

In the "Line and Cable Structures" section, a number of papers covered the problems of using checking and measuring instruments for these structures.

Recommendations, in which the directions of efforts underway at the the Kiev Branch of the Central Scientific Research Institute of Communications on developing the ASOTO [automated system for efficient maintenance] for further automation in direct connection networks, processing telegraphic correspondence by facsimile methods, developing new data communication systems and apparatus and measuring instruments based on microprocessors were approved, were made at the conference.

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ODA-20M MICROPROCESSOR NETWORK STATION

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA (NAUCHNO-PROIZVODSTVENNYY SBORNIK) in Russian No 1, Jan-Mar 84 p 66

[Advertisement]

[Text] The ODA-20M Microprocessor Network Station is intended for building terminal local networks, the subscribers of which interact with each other and collectively use the network's common resources.

The two lower levels of the standard HDLC [High Level Data Link Control] protocol are supported by a programmable modem. Program organization of data communication enables operation in various network structures, including those based on multistation communication channels, widely used for building local networks; packet mode of data exchange with any packet length; efficient priority control in multilink systems; and adaptation to communication channel characteristics to optimize information communication rate and validity.

The software is a multitasking, real-time system supporting efficient use of local and remote resources in the network.

Relative-phase signal keying is used for the data communication. The communication rate is set automatically as a function of line parameters. Various service two-wire lines are used as communication channels.

Basic Technical Data

Data communication rate	1,200 to 384,000 bits/s
Communication line length	up to 20 km
Number of stations connected to one monochannel for communication	up to 20
Probability of incorrect reception	10^{-7}
Microprocessor type	K850 IK 80 [as written]
RAM	32K bytes
ROM	4K bytes

Developer: UkSSR Academy of Sciences Institute of Cybernetics imeni V. M. Glushkov

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'MICROPROCESSOR SYSTEMS IN ASUTP'S' CONFERENCE

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 84
pp 127-128

[Article in "Symposia, Conferences, Meetings" section, by I.S. Yeremeyev and G.S. Kodenskiy: "Problems in Development of Microprocessor Systems in ASUTP's [Automated Systems for Controlling Production Processes]"]

[Text] The "Problems in Development of Microprocessor Systems in ASUTP's" conference, organized by the Kiev Institute of Automation imeni the 25th CPSU Congress, the All-Union Institute of Scientific and Technical Information and the Sevastopol Branch of the RDENTP [expansion unknown] of the "Znaniye" [Knowledge] Society of the Ukrainian SSR, was held in Sevastopol on 5-7 September 1983. About 100 specialists, representing leading enterprises, scientific research and design organizations and also VUZ's of the Ukrainian SSR and RSFSR, took part in the conference's proceedings.

Forty papers and reports, which can be arbitrarily divided into three groups, were heard at the conference:

General principles of the design of ASUTP's on the basis of series-produced microprocessor hardware.

Methods and means of developing distributed intelligence systems.

Application of microprocessor systems in specific systems for automation of production processes.

Among the papers and reports of the first group, the most full of information and most interesting proved to be papers by B.B. Timofeyev and Yu.I. Artemov, "Basic Directions of the Utilization of Microprocessor Hardware in ASUTP's;" K.I. Didenko, K.I. Karnaukh et al., "MikroDAT (Facilities for Transfer of Information and Facilities for Processing Information in Problem-Oriented Systems);" V.V. Ovchinnikov, K.V. Peselev et al., "Analysis of Experience in Application of and Development Prospects for SM [International System of Small Computers] Computers for ASUTP's;" V.Ya. Sidorenko et al., "Computing Systems Based on SM-50/60 Microcomputer;" and a report by V.M. Politykin et al., "Asynchronous Computer System Based on 'Elektronika-60' Microcomputer;" etc.

It was stressed more than once in these and other papers and reports that, in spite of expectations, the application of microprocessor engineering in ASUTP's has not resulted in substantial reduction of the overall dimensions of systems and of the power required by them, since, unlike processors and the memory, the peripheral devices practically did not undergo substantial changes, and their proportion in ASUTP's grew considerably. However, microprocessor hardware made it possible to implement a qualitative rapid change from centralized data processing systems to distributed intelligence systems. This also explains the very high percentage of papers and reports of the second group devoted to this problem.

Here it is necessary to single out the informative paper by I.M. Shenbrot and V.M. Aliyev, "Design of Distributed ASUTP's," as well as the papers by G.S. Kodenskiy, "Development Trends for Architecture of Local Systems in ASUTP's;" I.S. Yeremeyev, "Ways of Improving the Degree of Reliability of Information in Systems Based on Microprocessors;" S.V. Golovanov, "Multicomputer Computer Systems Based on High-Speed Computer Network;" and the reports by V.S. Sadovskiy, "Computer Terminals for Communicating with Controlled System, Based on SM-50/60 Microcomputer;" Ye.N. Pilipchatin, "Video Terminal Subsystems Based on Microprogrammable Controllers;" and G.I. Ivanov and S.A. Tret'yakov, "Design of Protocols for Distributed Multiprocessor Logical Control Systems."

Sounding as the leitmotif in these and other papers and reports was the idea of the possibility and necessity of developing a network based on special-purpose microprocessor hardware facilities (on the basis of standard microprocessor systems), based on the principles of microprogram control. Here the following are considered the principal steps in the development of these microprogrammable machines and systems based on them: determination of application functions to be entrusted to machines and systems as a whole; selection of specific hardware; determination of structure of the system as a whole; calculation and improvement of the efficiency of application functions; calculation and improvement of reliability indicators; and ensurance of a high degree of reliability of the results of the processing of information in the system. Here the principal ways of improving the reliability and degree of certainty are considered ways involving the introduction of redundancy of hardware and solutions, and functional redundancy.

Among papers of the third group, interest among the participants in the conference was evoked by papers by Yu.I. Artemov et al., "Multiprocessor System for Controlling Multisection Compressor Plant;" I.N. Bogayenko et al., "Software for Systems for Testing and Technical Diagnosis of Rolling Production Equipment;" G.S. Kodenskiy, et al., "Development of System for Automating Hot-Rolling Sheet Mills, Based on Net Structure of Microprocessor Facilities;" A.V. Grinenko, "Decentralized Microprocessor System for Controlling Rolling Mill Finishing Group;" Ye.V. Leonidov-Kanevskiy et al., "Development of Information Facilities for Rolling Mill Control Stations;" and B.L. Putov, et al., "Problems in Development of Microprocessor Systems for Controlling Robots and Robotic Systems for Non-Standard Environments."

In these and other papers and reports much attention was paid to taking into account the speed of response of microprocessor systems from the viewpoint of enabling functioning in real time, to problems relating to efficient software and information facilities, as well as to improving the reliability of hardware and developing built-in facilities for testing and diagnosis.

The discussions which developed in the course of reviewing the papers and reports contributed to the active exchange of opinions and ideas, to refinement of concepts and methods of developing microprocessor systems in ASUTP's, as well as to an objective evaluation of the current state of affairs in the area of ASUTP hardware and software.

The materials of the conference will be sent to VINITI [All-Union Institute of Scientific and Technical Information] for deposition.

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PUBLICATIONS

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